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ABSTRACT

In this six part handbook, secondary school teachers and students are provided with information and concepts needed to analyze the energy situation from an economic perspective. Part 1 begins with an economic analysis of the U.S. energy situation. It includes charts, graphs, and readings on energy use before 1970, consequences of oil supply restrictions by the Organization of Petroleum Exporting Countries and the American response to them, government regulation of the petroleum market, the effects of higher energy prices and price control on inflation, and the government's energy policy. Part 1 concludes with a glossary and bibliography. Teaching strategies are presented in part 2. Scarcity, supply and demand, data analysis, energy source comparisons, effects of prices on market behavior and energy consumption, and conservation economics are treated in 11 lessons combining handouts, simulations, role plays, and discussion. Answer keys and supplementary activities are also included. Part 3 is a reading on energy supply and demand for advanced students. Part 4 consists of two sets of pre- and posttests with answer keys. Part 5 is an annotated catalog of curriculum guidelines, background readings, and teaching units. The handbook concludes with a section of visuals and handouts to accompany the lessons in part 2. (LP)

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The Economics of ENERGY

A Teaching Kit (Grades 7–12)

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Foreword

The development, growth, and subsequent high standard of living in the United States were built in large part upon readily available and seemingly inexhaustible supplies of energy. Our comfortable homes, private and public transportation systems, agricultural bounty, and industrial output in good part resulted from low-cost, abundant energy—roughly 90 percent from fossil fuels since 1910.

Some of these benign conditions appeared threatened as the Organization of Petroleum Exporting Countries swung into action in the "energy crisis" of 1973–1974 and the crises that followed. For the first time, the American energy future became cloudy and uncertain and new assessments of our energy situation became imperative. The analytic tools and the descriptions presented in this teaching kit are essential to an understanding of what has happened in world—and domestic—oil markets, and also to what the future may hold for OPEC as well as ourselves.

This publication is in the tradition of one of our Economic Topics, *The Economics of the Energy Problem*, which was published by the Joint Council on Economic Education in 1975. However, the present effort provides junior and senior high school teachers and students with much more of the essential information and concepts needed to help them analyze the energy situation from the perspective of economics. Part I provides an analysis of, among other things, U.S. energy use prior to 1970, the development of OPEC and the United States response to it, government regulation of petroleum product markets, the effects of price controls, the nation's adjustment to higher energy prices, the relation of energy to inflation, and proposals for future energy policy. Part I concludes with a glossary and a bibliography.

Part II presents a variety of strategies for teaching about energy economics. Part III is a reading for advanced students on energy supply and demand. Part IV consists of two sets of pre- and post-tests for junior and senior high school students. Part V provides an annotated catalog of materials for teachers. Part VI contains the visuals and handouts for the lessons in Part II.

This publication was made possible through the generosity of the Amoco Foundation, Inc. The Joint Council acknowledges with thanks the continuing commitment and support the foundation provides to economic education. In particular, we are grateful to Martin J. Shallenberger, senior staff public affairs representative of the Standard Oil Company (Indiana)—Amoco—who perceived the need for effective materials on the economics of energy that led to the present project.

Anthony F. Suglia
Director, Affiliated Councils and Centers;
Energy Project Director
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I. Energy: An Economic Analysis

GEORGE HORWICH
Purdue University

● ● ● HIGHLIGHTS ● ● ●

- The United States relied on wood as its major energy source through most of the nineteenth century. Wood was followed by coal, whose production peaked around the time of World War I. Oil and natural gas output increased up to the beginning of the 1970s. Until the Organization of Petroleum Exporting Countries (OPEC) began massive intervention in the markets, the United States always enjoyed relatively low-cost energy. SEE PAGE(S): 4

- From 1900 to 1970, U.S. energy use per capita tripled, reflecting a sharp rise in the price of labor relative to energy. Among major industrial countries, the United States and Canada are at the upper end in the use of energy per unit of gross national product (GNP). This higher energy use does not reflect a lack of efficiency, but rather a particular mix of energy-utilizing conditions: low population density, greater dependence on the automobile as a productive resource, variable climate, relatively large-scale extractive industries, and a high proportion of detached, single-family houses. 6

- The fundamental disturbance in energy markets during the 1970s was due to a sudden slowing down in the growth of world oil output. This followed the nationalization of oil properties on their territories by members of OPEC and was due, first, to a deliberate restriction of supply by Saudi Arabia and several smaller producers, and later, to political instability in the Persian Gulf region. 8, 10

- U.S. petroleum-product markets were regulated during the 1970s both in respect to price and allocation. At the refining and marketing level, allocation was based on generally outmoded historical-use patterns and priorities established by political influence and bureaucratic preference as well as by "need," evidenced by whether companies were "crude rich" or "crude poor." The lack of a proper incentive structure discouraged stockpiling before crises and encouraged it during crises. Allocation by free-market price differs. It is based on maximum contribution to GNP and tends to maximize total GNP and employment. 10

- Price ceilings in the retail markets for petroleum products, particularly gasoline, brought on allocation by other means, such as using odd or even plate numbers to designate the day of the week on which drivers could buy gasoline. Those customers who were willing or able to spend the most time searching for open stations

or waiting in line (queuing) were able to get more fuel. However, searching and waiting in line raised total costs borne by the consumer. The claim that price controls prevent inflation and are generally more equitable and efficient than free markets does not stand up under analysis. 12

- The free market does not meet the emergency needs of local government and other public units, such as schools and health-care services, that lack flexible funding capability. Nor does the unregulated market make provision for low-income families. All such units would probably benefit more from direct allocations of cash, financed by general revenue funds supplemented by existing taxes on the oil industry. 13

- Allocation by coupon rationing is a staggering administrative undertaking that seems to present more problems than it solves, even with the existence of a legal resale market for coupons. Given the natural tendency of markets to match demand with supply, even under price ceilings, coupon rationing is not likely to be required or justified for an extended period. 14

- Price controls in the crude-oil market, including the system of entitlements, raised total oil consumption, lowered domestic oil production, and raised the level of imports as well as, probably, the world price of oil. 14

- Wellhead price controls in the interstate natural gas industry are essentially an historical accident; they have been a serious deterrent to natural-gas exploration and production for more than two decades. In view of the ready availability of oil imports as a substitute, price ceilings on natural gas have not been associated with the usual symptoms of a commodity in short supply. 15

- The decontrol of U.S. oil prices, starting in 1979, ended the earlier decline of U.S. oil production and contributed to the increase in coal prices, coal output, and total energy supply, which had declined between 1972 and 1975. 16

- From 1973 to 1980, U.S. energy prices, corrected for inflation, rose 73 percent, an increase exceeded only in Italy and Japan among major industrial countries. U.S. energy consumption fell from an annual growth rate of 2.9 per cent in 1969–73 to 0.2 per cent in 1973–80—a greater percentage reduction than that of any other major industrial country, except Japan. In 1980 petroleum consumption began to fall, with the decrease coming entirely out of imports. From its 1980 peak to this writing, the real price of energy has fallen, both because of the continuing supply and demand adjustment to the price increases of the 1970s and because of the recession in the world economy. 16, 17

- The relationship between energy costs and inflation has been greatly overstated. The rise in energy prices was responsible for three or four percentage points of the 12 to 13 percent inflations of 1974 and 1979–80. Energy prices did not otherwise play a causal role in the inflation of the 1970s. 17

- Monopoly organizations that cannot prevent the entry of new producers into an industry will eventually lose their monopoly power. This was demonstrated in March 1983 when the competition of non-OPEC sources of supply forced OPEC to lower its official prices for the first time in its history. 17

- The claim that the world is rapidly depleting its fossil fuel resources and must therefore embark on a government-directed program to develop energy alternatives is faulty in premise and conclusion. The evidence on ultimate resource availability is mixed and, at best, uncertain. The issue is, moreover, irrelevant to the optimal approach to the energy future. In the past, free-market prices have provided adequate incentives both to energy conservation and the creation of new sources regardless of the degree of ultimate resource availability. 18

- Those who do not agree that the free market has the long-run capability referred to in the previous point advocate (1) energy taxes to reduce energy consumption further and (2) government-controlled funding for promising alternative sources of energy. 18

- In the free-market view, government is generally unqualified to make efficient production decisions. In the energy field, government should at most fund basic research and coordinate contingency planning. 18

- The case for price controls when there is a disruption in the market system is the psychological argument that they calm public fears and prevent social instability whose costs exceed those of the controls and allocations. If true, government can help create an environment in which free-market activity is acceptable by avoiding inflammatory rhetoric directed at the oil industry and by concentrating on development of a large Strategic Petroleum Reserve and a plan for taxes or revenues to low-income families and qualified local government units. 19, 20

ENERGY: AN ECONOMIC ANALYSIS

Introduction

The 1970s saw tumultuous events occur in energy markets, both in the United States and in the world at large. The fundamental disturbance was a sudden and sharp decline in the annual growth of the energy supply, particularly of oil. The supply of oil also became much less stable than it had been, and in fact was disrupted several times during the decade. Accompanying these supply changes was a sharp increase in price that spilled over into other energy markets and, to some extent, into the total economy.

By early 1983, however, there were signs that another transformation in the energy situation might be on the way. Production from new sources of oil, conservation in the use of oil products, and the effects of a worldwide recession led to a 15 percent reduction in posted oil prices by the Organization of Petroleum Exporting Countries (OPEC). This was the first decline in OPEC's posted prices since the "energy crisis" began.

In what follows we will be examining the energy crisis from the viewpoint of economic analysis by addressing four basic questions:

1. What caused the sudden slowdown in world energy supply? Is the world running out of oil and other energy sources, and, if so, is that prospect relevant to the energy crunch of the 1970s?
2. Was the U.S. system of price controls and allocations helpful in easing the impact of the crisis, including the impact on the distribution of income and the overall rate of inflation, or did government intervention make the crisis more severe?
3. Should the "energy crisis" completely abate, what ought to be the role of the U.S. government in preparing for and managing future energy supply disruptions?
4. What should be the role of the U.S. government in guiding the transition to future energy supplies and demands? Should government play an active role in stimulating additional supply from conventional or alternative energy sources and in encouraging conservation in the use of energy?

Energy Production and Prices before 1970

Throughout most of the nineteenth century, wood was the predominant energy source in the United States. Long after European industrial countries had switched to coal, the United States continued to cut its ample forests to procure the wood that was its primary source of fuel. United States practice served a dual function: it cleared the land as well as providing cheap and plentiful fuel.

In time, wood for fuel became relatively scarce and expensive in the United States. The second energy era—that of coal—began about 1850. As shown in Figure 1, coal supplied about 40 percent of total U.S. energy by 1880 and about 70 percent by 1900. The use of coal peaked not long after—around World War I. The third energy era—that of petroleum—took hold between the two world wars. Petroleum use grew and by 1970 supplied almost half of the total energy used by the United States and by the world as a whole. In the United States, oil and natural gas together accounted for three-fourths of energy consumption in early 1983.

Natural gas was initially a waste by-product of oil production. The gas was usually burned at the site or allowed to escape into the atmosphere. But it soon found local use and was produced independently from natural gas deposits as well as from oil wells. Beginning in the 1920s, advances in pipeline technology enabled the gas to be transported over considerable distances, and natural gas emerged as a major energy source. By 1970 the United States was producing more natural gas (in B.T.U.*-equivalent units) than oil. But imported oil plus domestic oil production increased oil consumption to 44 percent of all the energy used in the United States, while consumption of natural gas was 33 percent, coal 19 percent, and hydro power 4 percent. There were also minor percentages of energy from nuclear and wood sources in use in 1970.

The role of low-cost energy in the development of the U.S. economy has not always

*See glossary for definitions of technical or other unfamiliar terms.

NOTE: *Energy: An Economic Analysis*, the paper on which the version here is based, is available from the Order Department of the Joint Council for 86.00 per copy postpaid (photocopy; 70 pp.; includes 6 tables and 15 charts).

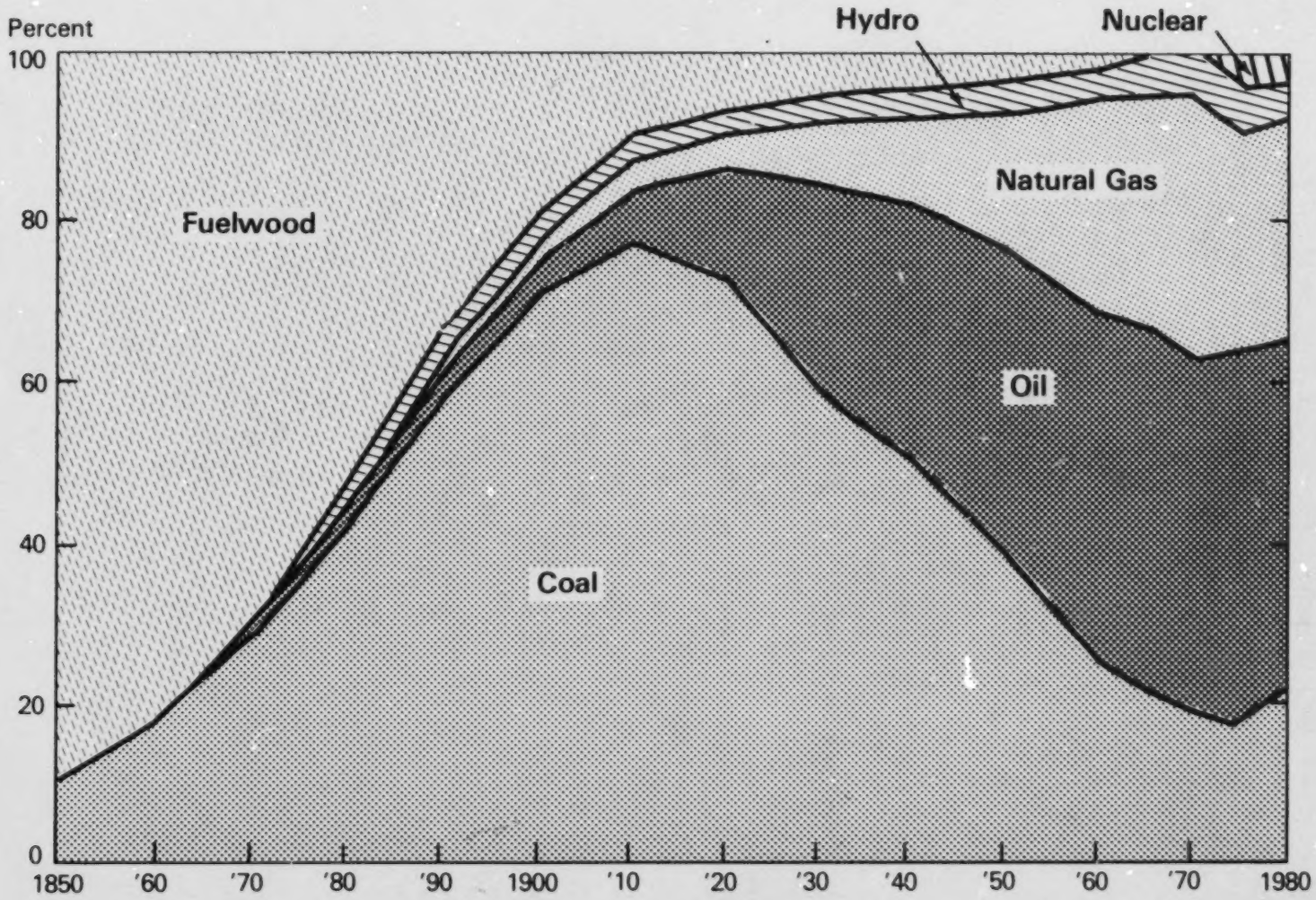

Figure 1. Sources of U.S. Energy Consumption, 1850-1980.

Sources: 1850-1960: H.H. Landsberg and S.H. Schurr, *Energy in the United States* (New York, Random House, 1968); 1960-1980; U.S. Energy Information Administration, *1981 Annual Report to Congress,* Vol. II. (Natural gas liquids, shown separately in both sources, are combined with oil in the chart.)

been appreciated. For example, between 1890, when the oil industry had become national in scope, and 1970, the output of oil in the U.S. increased 77-fold. In the same period, the price of oil rose from 77 cents per barrel to $3.18. But the general wholesale price index meanwhile almost quadrupled. In terms of 1890 dollars, the price of oil in 1970 was thus 82 cents, only 5 cents higher than it had been eighty years earlier.

Natural gas output increased 98-fold between 1890 and 1970, while the price went from 7 cents to 54.8 cents per thousand cubic feet. However, in terms of 1890 dollars, the 1970 price was 14 cents, only twice as much as 80 years earlier. Meanwhile, the output of the older industry, coal, increased only threefold during this 80-year interval. The price of bituminous coal in 1970 was $1.61 per ton in 1890 dollars, compared with 99 cents in 1890.

Energy-Use Comparisons

We can also view how energy affects the American economy by relating the growth of energy consumption to the gross national product (GNP), to the total population and labor force, and to other variables. We can also use these comparisons to examine international differences in energy use.

The Energy/GNP Ratio

Although we have been using more energy as the economy has grown, our use of energy has fallen in relation to the GNP. As Figure 2 indicates, by 1970 the United States was using only half as much energy to produce a unit of gross national product than in 1850, although there was an interim rise from 1895 to 1920 that coincided with the growth of heavy industry. The decline from 1920 to 1955 generally reflected the electrification of the American economy.

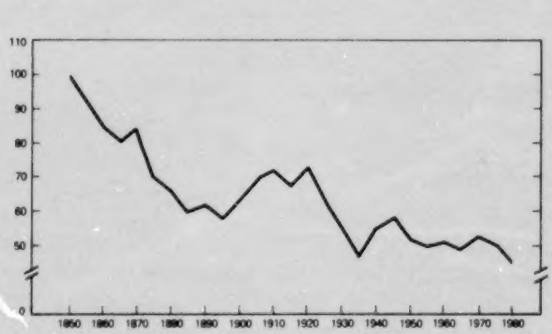

Figure 2. U.S. Energy Consumption per Unit of Real Gross National Product, 1850-1980 (1850 = 100).

Sources: 1850-1955: H.H. Landsberg and S.H. Schurr, *Energy in the American Economy, 1850-1975* (Baltimore, Johns Hopkins Press, 1960); 1955-1980: U.S. Energy Information Administration, *1981 Annual Report to Congress*, Vol. II.

Even though electric power generation is highly energy intensive—using more energy (in BTUs) than it produces—electricity makes possible large increases in gross national product and reductions in the energy/GNP ratio. This reduction comes about because electric power allows factories and worksites to be located near raw materials, labor supply, and other resources independently of the location of the power source. Instead of transporting coal or oil to each individual plant or workplace, coal or oil is delivered to a single location, the power source, converted into electrical energy, and transmitted to the individual users.

The Energy/Population Ratio

The use of energy has been increasing relative to the total population and the labor force. In 1970, energy use per capita and per employee was three times greater than it had been in 1900. Over the same period, the dollar cost of labor (the average wage rate) increased almost eight times more than the price of oil and almost five times more than the price of coal. The greater increase in the price of labor relative to the price of fuel created an incentive to use less labor and more fuel wherever possible. This was true for industry and agriculture as well as for individuals and families. Fully 40 percent of the increased energy consumption was by the household sector for automobile, bus, and air transportation; for home heating and cooling; and for a host of household labor-saving devices commonly associated with the improved U.S. standard of living.

The Energy/GNP Ratio Among Countries

Table 1 shows the 1978 ratios of total energy use to real GNP for leading industrial countries relative to that of the United States. The entry for Canada shows that if the U.S. ratio is set at 100, Canada's ratio is 111. The latter figure indicates an 11 percent higher energy use in Canada relative to its GNP than in the United States. At the other exteme, France has an energy-use/GNP ratio only 49 per cent as great as that of the United States. The other major countries shown fall between these extremes in their use of energy relative to their total output of goods and services.

It is tempting to conclude, as others have, that since the United States and Canada use much more energy per unit of output than do other industrial countries, the United States and Canada are wasteful in their use of energy. However, this consumption pattern can be ex-

TABLE 1
Ratio of Total Energy Consumption to Real Gross National Product, Major Industrial Countries, 1978
(U.S. ratio = 100)

	Energy/GNP
Canada	111
United States	100
United Kingdom and Ireland	89
Italy	72
Benelux and Denmark	72
Finland, Norway, and Sweden	71
Australia and New Zealand	69
Japan	58
West Germany	57
France	49

SOURCE: U.S. Energy Information Administration, *1981 Annual Report to Congress*, vol. III.
NOTE: The data actually report energy/GDP ratios. GDP is gross domestic product, which is GNP less product originating in enterprises owned by a country's nationals, but located outside its borders. However, the difference between using GDP and GNP in the ratios shown here is very small.

plained by underlying economic circumstances.

Energy use and geography Two key factors in the relatively high use of energy in both Canada and the United States are their huge geographic size and their scattered, low density, populations. As a consequence, both freight and passenger long-distance transportation is essential to their economies.

The economic roles of the automobile and roads are important—and underrated. Workers' ability to secure the highest-paying jobs and the economy's ability to equalize wages within and between regions at their highest level depend upon rapid and flexible long-distance transportation. This, of course, is exactly what the automobile and the state, federal, and provincial road-building programs provide.

The dependence of the geographically large countries on the automobile for the smooth functioning of their labor markets is usually overlooked. It is easy to forget that Europe and Japan are, comparatively speaking, small, densely populated areas in which walking, bicycling, and the use of mass-transit facilities all have an economic advantage that simply is not present to a similar extent in most of the United States or Canada. Great Britain and West Germany each occupy an area slightly smaller than the state of Oregon, but there are 56 million Britons and 62 million West Germans, versus only 2.5 million Oregonians (1982 figures). Japan's 119 million people live in an area smaller than California, or to look at it another way, the United States (population: 232 million in 1982) has double the population of Japan, spread over an area somewhat more than twenty-five times as large as Japan's.

Energy use and gasoline taxes Because of the importance of the automobile and the fuel to run it in moving goods and people, taxes on gasoline have been kept low in the United States compared to those in other countries (see Table 2). This is an implicit recognition that the automobile is relatively more important in the United States economy.

TABLE 2
Effective Rates[a] of Taxation on Gasoline in Major Industrial Countries, 1970, 1975, 1980

	1970	1975	1980
Canada	82%	78%	40%
France	290	131	159
West Germany	264	165	111
Italy	364	214	188
Japan	142	50	64
United Kingdom	257	65	46
United States	44	25	13

SOURCE: U.S. Department of Energy, *International Petroleum Annual*; International Energy Agency, *World Energy Outlook*, 1982.
NOTE: The ratios for 1970 are probably a truer reflection of the long-run tax level. All of the countries listed have allowed the tax ratios to fall as a partial offset to the higher oil and gasoline prices of the 1970s.
[a]The effective rate of taxation is the ratio of gasoline taxes per gallon to the price of gasoline net of taxes.

Climate and other determinants of energy use Other factors causing a relatively high energy/GNP ratio are the prevalence of cold winters such as in the northern United States and in Canada; high summer temperatures such as those that cause widespread use of air conditioning in the United States; a relatively large extractive industry—mining, and producing metals, minerals, and energy itself, and a high proportion of detached, single-family houses.

Summary

Every country has its own unique mixture of economic conditions. These include the type of climate, the availability of raw materials, labor (skilled and unskilled), and transportation as well as the relative standard of living. There is no single energy/GNP ratio that is appropriate for all countries. Changes in the conditions, as reflected in costs, will naturally affect the total amount of energy used.

The 1970s and OPEC

At the start of the 1970s energy in the United States constituted about 10 percent of the total resources used to produce GNP. Oil accounted for almost half of total energy consumption, with the United States producing 80 percent of that oil and importing 20 percent. Net energy imports, however, were only 8.6 percent of *total* U.S. energy consumption. We were as near to being energy independent, in the sense of importing a relatively small amount of our total energy, as almost any major industrial country in the world. Only the Soviet Union was totally self-sufficient in energy.

Developments in World Oil Production

But new trends were developing. After more than a century of almost uninterrupted growth, the production of oil in the United States peaked in 1970 and thereafter declined almost 3 percent a year (see Figure 3). The decline was not due to a lack of discoverable oil. Rather, cheaper sources were available elsewhere. Large new fields, at relatively shallow depths, had been discovered in countries surrounding the Persian Gulf, and in North Africa, Indonesia, and Venezuela.

The newly found oil was so cheap to produce that the United States instituted import quotas in 1959 to prevent this new, cheap oil from flooding the domestic American market. But, by the early 1970s, the price of the foreign oil was starting to rise to the U.S. level, along with general increases in commodity prices throughout the world. In early 1973 the quotas were abandoned.

Other forces also began to affect oil prices in the early 1970s. One was the leveling off of new petroleum discoveries. For example, while world oil output between 1950 and 1970 increased by a factor of 4, total proved oil reserves over this period increased by a factor of 7 (see Table 3). This rate of increase in the reserve base is hardly consistent with the widely held view that the world was "running out of oil." But by the early 1970s, the pace of new worldwide discoveries had, temporarily at least, slowed, and this condition alone was bound to raise oil prices eventually.

The Rise of OPEC

A more ominous development was the gradual nationalization of oil properties by members of the Organization of Petroleum Exporting Countries (OPEC),* a process that began in the late 1960s and culminated in 1973. This in itself need not have had widespread economic consequences. In competitive markets, there is no necessary difference in the levels at which private companies and producer governments choose to produce or price their oil.

But in the 1970s, through an unlucky accident of nature and of political geography, a few Arab oil-producing countries controlled more than half of the world's known oil reserves and enough of world oil production to exercise monopoly power if they colluded. And this, of course, is exactly what some of them did, starting in early 1973 when their ownership of the oil properties had become firmly established.

While the international oil companies had been quite competitive, the nationalization of just one country's oil wells—those of Saudi Arabia—placed enough market power in one producers' hands to alter the shape and structure of the world oil market. The dramatic rise of Saudi Arabia in 1970–1973 as a dominant producer is documented in Table 4.

1973–1974 Disruption

The oil embargo—the decision of Arab oil-producing nations not to sell oil to the United States and the Netherlands because of their

TABLE 3
World Petroleum Reserves and Production,[a] 1950–1980
(billions of barrels)

Year	Reserves	Production	Years of Inventory
1950	77	3.8	20
1960	290	7.7	38
1970	531	16.4	32
1971	611	17.7	35
1972	633	18.6	34
1973	664	20.4	33
1974	627	20.5	31
1975	712	19.5	37
1976	659	21.1	31
1977	642	21.9	29
1978	646	22.0	29
1979	642	22.9	28
1980	649	21.8	30

SOURCE: *International Petroleum Encyclopedia*, 1976 and 1980; *The Oil and Gas Journal*, various issues.
[a]Includes estimates of proved reserves in Communist countries.

*The OPEC countries: Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

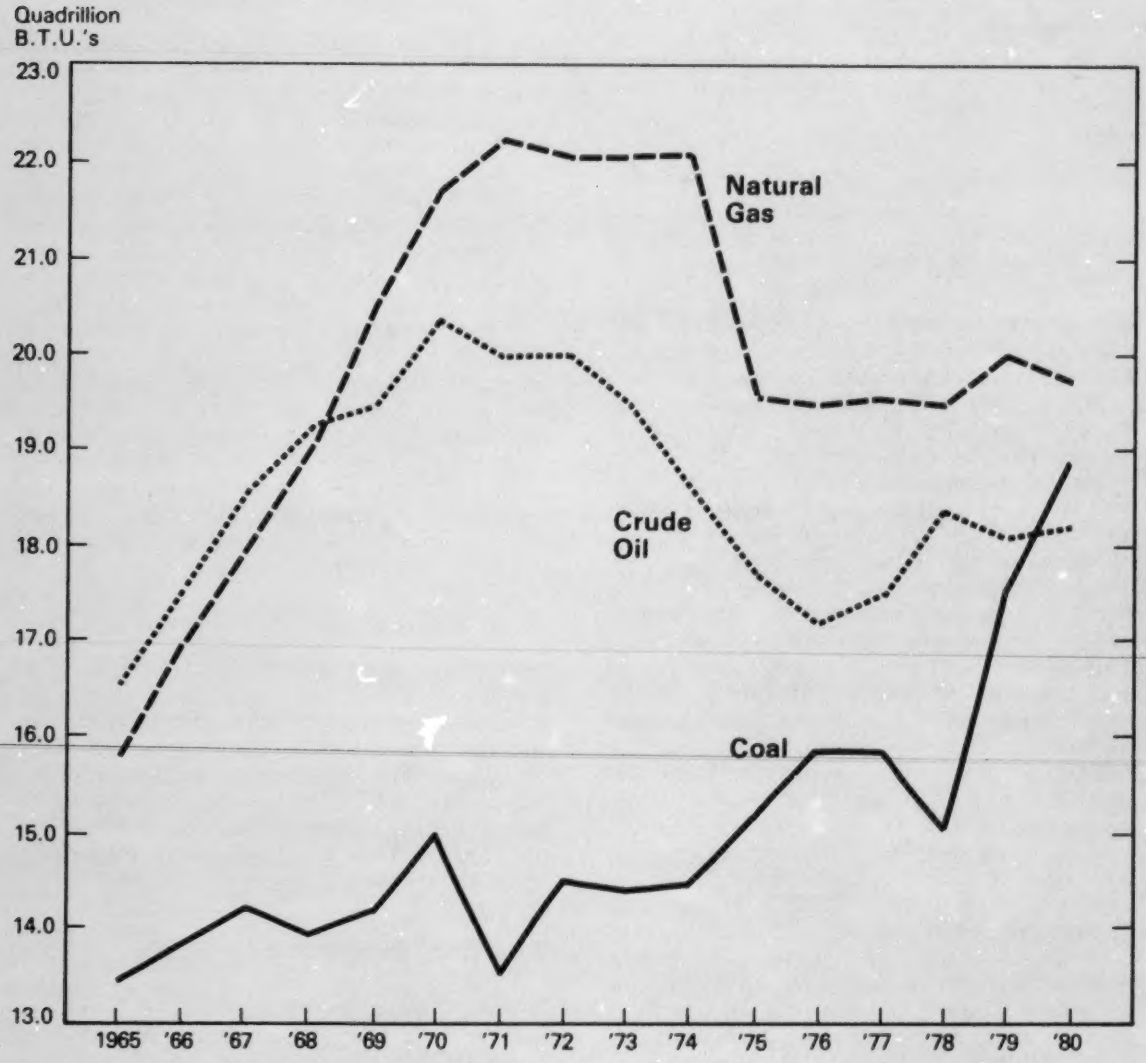

Figure 3. U.S. Production of Coal, Crude Oil, and Natural Gas (in Quadrillion B.T.U.'s), 1965-1980.

Source: U.S. Energy Information Administration, *1981 Annual Report to Congress,* Vol. II.

TABLE 4
OPEC Share of World Oil Production and Saudi Arabia Share of OPEC Production, 1960–1980

	OPEC % of World Oil Production	Saudi Arabia % of OPEC Production
1960	42	15
1970	52	16
1973	56	25
1980	46	36

SOURCE: 1960–1973: U.S. Bureau of the Mines; 1980: *BP Statistical Review of the World Oil Industry, 1980.*

support of Israel during the October 1973 war—was more effective psychologically than in fact. The embargo, which lasted from October 1973 to March 1974, was ineffective because in the highly competitive world tanker market, it is impossible either to monitor cargo or to prevent substitute movements of cargo. In fact, U.S. oil companies replaced lost imports of Arab oil with oil from Iran and other countries.

The real "oil shock" came from the OPEC decision to produce less oil. World oil production failed to increase at all in 1973–1974. It had risen more than 9 percent the year before. This sudden halt in the growth of world oil output is explained by the deliberate, monopoly restriction by Saudi Arabia and several smaller Arab producers in the Persian Gulf region. The restriction was directed not only at their current production rate, but at the rate of exploration and drilling for new reserves.

Of all the statistics about petroleum, perhaps none is more basic or revealing than the following: from 1918 to 1973, world oil production grew at an average rate of 7.0 percent per year, but from 1973 to 1980, the growth rate was 0.9 percent per year—an 87 percent reduction. This simple fact—*the abrupt slowdown in the growth rate of the world's oil production, which was due primarily to supply restrictions imposed by members of OPEC*—is sufficient to explain the sharp price increases—not only in crude oil and oil products but, through spillovers of demand, in all energy prices—that rocked the world's economies in the 1970s. Crude-oil prices between October 1, 1973, and January 1, 1974 rose almost fourfold, from $3.01 to $11.61 per barrel. This price rise was a result of the first of three periods of supply disruption.

1978–1979 Disruption

Five years after the first supply disruption, there was a second, which was due to the political and social upheaval in Iran. The resulting interruption in Iranian oil output reduced total world oil production by 10 percent. Saudi Arabia thereupon increased its output to offset about half of that loss. This increase was widely interpreted in Western countries and Japan as a generous act by the Saudis. However, more sophisticated economic analysis leads to the conclusion that producers with monopoly power will always find that they can increase their profits by partially substituting their own output for any loss of market supply from other sources.

After the second disruption, the world price of crude oil more than doubled—from $14 to an average of about $35 a barrel. Accompanying the pressure from reduced supply on price was an increase in world demand. The extra demand was aimed at raising oil inventories. Whereas the 1973–1974 disruption in world oil supply had been a deliberate, controlled act by Arab producers, the virtual disappearance of Iranian oil exports resulted from events seemingly controlled by no one. The instability of the entire Middle East producing region was now widely perceived and indicated to importing nations the desirability of maintaining larger oil inventories.

1980 Disruption

Indeed, less than two years later, in September 1980, a third disruption in world oil supplies resulted from the outbreak of war between Iran and Iraq. And while the net additional loss of oil was about equal to that which had occurred in 1979, the existence of a new higher level of oil inventories made possible a drawing on those inventories that muted the upward effect on oil prices.

The U.S. Response to OPEC

The quadrupling of crude oil prices in 1973 hit the oil industry while it was still under the general wage and price controls imposed in 1971. These controls, which had expired for other segments of the economy, became the basis of new ceiling prices on crude oil and petroleum products. The new ceilings included a fixed allowable profit margin.

Government Allocation and Equity Goals

In addition to the ceilings on prices and profit margins, the government created an elaborate set of rules to regulate the allocation of crude oil and oil products throughout the economy. A centralized distribution network replaced the price-directed market system.

The goals of these rules were to distribute

the available supply equitably; to keep the cost of gasoline, heating oil, and other petroleum products affordable to the majority of Americans; and to limit the windfall profits of domestic oil producers. The centralized bureaucratic means of achieving these goals resulted in costs both to America and to other oil-importing countries of the world that almost surely exceeded economic benefits.

The fundamental facts of early 1973 were that (1) commodity prices—including oil—were under severe demand pressure; (2) the phenomenal rate of discovery of new petroleum reserves in the postwar period had slowed; and (3) the Arab oil-producing countries had simultaneously acquired control of the oil properties in their countries as well as a considerable measure of market power. The exercise of that power took the form of a sharp reduction in oil production, which resulted in an escalation of prices.

For the importing countries, the best response to the increased scarcity of oil would have been a reduction in consumption and an increase in access to alternative sources of oil and oil substitutes. The costs of this response could have been reduced by drawdowns of oil inventories. That would have slowed the price rise and allowed other necessary adjustments to be made more gradually. The price controls and allocations, however, inhibited such adjustments. By keeping prices down, consumption was encouraged, domestic production was discouraged, and resources were diverted into less valued uses. Ultimately, the controls appear to have cost more than any benefits that Americans—including those with low incomes—might have gained.

The Free-Market Mechanism

The appeal of regulated markets is often based on a lack of awareness of the efficiency with which an uncontrolled market tends to operate. Prices in the retail gasoline market, for example, link millions of consumers; several hundred thousand service stations; several thousand distributors; some three hundred or more refineries in the United States, Canada, the Caribbean, and Western Europe; and crude-oil producers throughout the world.

Economists are almost unanimous in believing that there is no central allocation scheme that can begin to process the enormous amount of information about supply and demand that is revealed by nationwide relative price movements. Information about thousands of alternative sources of supply and the constantly changing preferences of several hundred million consumers is reflected in prices and profit margins and monitored by telephone, word of mouth, and methods as yet undocumented by those who stand to gain from responding to that information. No individual or group of civil servants—even with the highest qualifications and motivation—can compete effectively with the efficiency of the decentralized market process.

Regulation in Petroleum Product Markets

During the 1970s, the controlled prices in markets for refined products of oil were allowed to rise along with increases in the cost of crude oil. But other costs—for labor and capital equipment—could be passed through to price only to a limited degree. This meant that oil products tended to sell below "market-clearing"—equilibrium—levels.

To make matters worse, strict limits on profit margins were placed both at the refinery and retail level. This, together with the price ceilings, destroyed the basic signaling mechanism that changes in prices provide in a free market.

Nonprice Allocation

Price controls on several petroleum products, including jet fuel and heating oil, were gradually removed by the mid and late 1970s. However, controls on gasoline, the major refined product, remained in force until January 1981.

Wherever ceiling prices are below the market-clearing level, a shortage in the economic sense exists: the quantity demanded in the market is greater than the quantity supplied. In this event, the available quantity must be allocated by nonprice mechanisms. Some of the mechanisms that come into play are briefly described below.

Allocation by mandatory rules The primary government allocation rule required suppliers of petroleum products, other than retailers, to sell to anybody who happened to have been a customer in the past. Special priority classes of users, such as farmers and providers of emergency services, were generally to be supplied 100 percent of their consumption of a designated previous period. All others were to be given a lower percentage, depending on the available supply. This historical-use allocation was almost always outmoded in crisis periods, owing to constantly shifting populations and economic requirements of given regions. Historical-use allocation also made businesses reluctant to take on new customers, and buyers unwilling to seek new sources of supply.

Allocation by queuing (lining up) Since there were no federal government rules concerning retail distribution, including sales of gasoline, nonprice allocation mechanisms were provided by state governments or were developed spontaneously by service stations and their customers. The most common method was for customers to wait in long lines (queues).

Allocation by quality reduction Suppliers in a price-controlled market will sometimes try to meet the unsatisfied demand by producing a cheaper, somewhat inferior product. This was true of the gasoline market in the 1973–1980 period. Unable to charge a price that was high enough to cover all their costs at market-clearing levels, service stations often reduced costs by supplying gasoline with lower octane levels, reducing the hours or days of operation, and reducing services such as cleaning windshields and checking under the hood.

The Shadow Price

Since gasoline consumers were faced with a whole array of nonprice allocation methods, they were forced to search for sources (a search which uses up gasoline and time) as well as to queue up. During the crisis of 1979, the Department of Energy estimated that motorists were on average spending 50 cents per gallon in searching and waiting. Since prices at the pump were then about $1.00 per gallon, the total or "shadow" price was in the $1.50 range.

Price Controls

Those who favor price controls often argue that the controls (1) keep the inflation rate down; (2) are more equitable than free-market prices because products are kept at affordable levels to low-income families and keep oil industry profits from rising; (3) when combined with mandatory allocations to selected individuals and groups, are more efficient than allocations by the free market; and (4) can improve allocative efficiency by preventing hoarding during price disruptions. Let us examine each of these arguments.

The impact on inflation While price ceilings limit the rise in market prices, the initial impact of the ceilings is to create search and queuing costs. Price controls also promote deterioration in the quality of products. In the case of gasoline, there are unpredictable closings of service stations which reduce and inhibit travel and freight movements. The result of all these forces is higher "effective" prices than posted prices and a generally depressing effect on the economy. Moreover, unsatisfied demand in a controlled market tends to be transferred to uncontrolled markets, whose prices are thereby raised. The controls do not succeed in preventing the general price level (the average of all prices) from rising.

Price controls and equity Whether equity is achieved by price controls on energy is also open to serious question. There is no assurance that under nonprice allocation lower-income individuals will get their proportionate share of the price-controlled product. And in spite of the controls, including limits on profit margins, oil companies generally experienced high profits during the oil supply disruptions. This occurred partly because of increased foreign revenues, but also because the domestic controls prevented new firms from entering the industry and competing with the established ones.

Free-market vs. mandatory-allocation efficiency The use of mandatory allocations to improve efficiency—to ensure that those with the greatest "need," such as providers of emergency services, farmers, and residents of cold climates, receive adequate allotments—is also of questionable effectiveness.

In a free market, those most willing to pay an increased price will tend to be those with the greatest economic stake in securing fuel. This will include people who drive farthest to their jobs or live in the coldest climates, and businesses that meet the biggest payrolls or have the most immediate fuel-utilizing tasks, such as farms that must harvest a seasonal crop.

In the alternative approach, a centralized authority seeks to allocate product in response to perceived needs, defined both in terms of economic efficiency and widely accepted principles of fairness. There are several difficulties in this kind of allocation:

1. Having abandoned free-market distribution, it is difficult to reach consensus on whose needs should be given priority, on the grounds of either efficiency or equity. In a democracy, the allocation will almost certainly be politically influenced, with the best-organized and best-financed groups exercising heavy weight.
2. There can be no assurance that the requirements of all individuals who might qualify for a share of the product will be known and provided for.
3. Centralized allocation decisions cannot be changed easily or frequently because a bureaucracy must clear its decisions through many channels, including, in a democracy, political ones. Under a free market, by contrast, consumers of all products are self-se-

lected in a process highly responsive to daily, even hourly changes in underlying economic conditions, as revealed by prices.

4. We have seen that the most commonly used rule determined an individual's current allocation by the amount purchased in some preceding year. In a large and dynamic economy, the consumption of an earlier year is likely to be quite irrelevant to the requirements of current or future years.

In general, mandatory allocations tend to be based on convenient administrative rules, often supplemented by moral judgments as to desirable and undesirable uses of energy. None of these factors is likely to help in maintaining GNP and employment at their highest possible levels. Here are some examples of how things can go awry.

- At one point, the Department of Energy used October 1978 as a reference date for allocations of oil products. But this decision did not take account of summer vacation consumption patterns and thus ruined part of the 1979 summer season for thousands of people engaged in the tourist business, not to mention the plans of many tourists.
- Shortages, due to low allocations in Washington, D.C., and other major cities, were severe, while "surplus" gasoline on the New Jersey shore and in the rural Midwest farming areas went begging.
- The importance of the automobile as a factor of production and in the distribution of goods was ignored—in the cases of both passenger cars and company-owned fleets.
- Small, independent refiners, because of their political influence, received more than their proportionate share of low-priced, high-quality domestic crude oil (see section on crude oil, below). The smallest of these refineries, often referred to as "tea kettles," did a minimum amount of processing of the crude oil and were far less efficient than larger refineries. The regulations made many owners of small refineries into overnight millionaires.
- While regulations were placing an economic incentive on building "tea kettle" refineries, inflexible regulations on "passing through" costs and the freezing of profit margins prevented large refiners from investing in new facilities to process cheaper, higher-sulfur crude oil and to supply the increasingly required no-lead gasoline.

The impact on stockpiling It is often argued that mandatory allocations are necessary to prevent "hoarding" of supplies in a period of shortfall. However, the regulations themselves tend to encourage hoarding in an emergency since in a price-controlled shortage market, hoarding is likely to be a cheaper alternative than the searching and queuing it replaces.

One of the most important protections against disruptions of supply is the accumulation of stockpiles by private speculators in nondisrupted periods. Though stockpiling can be very expensive, particularly in periods of high interest rates, a sufficient windfall gain when prices rise in an energy emergency will cover the costs and make the activity profitable.

However, when prices in emergencies are controlled or expected to be controlled, companies tend to limit their pre-emergency inventory holdings. Moreover, the risk of being forced to share oil with companies whose supplies are short further reduces the incentive to provide for emergencies by precrisis stockpiling. In fact, federal and state authorities tended to deny allocations to firms that had installed back-up capacity to switch to gas or to coal. Such measures effectively penalized farsighted companies and rewarded less prudent ones with additional supplies.

Problems of the free market These criticisms of mandatory allocations do not imply that price-determined market allocation is without its problems. In particular, state and local governments—including school districts and providers of emergency services—seldom have the flexibility and resources under the law to compete in suddenly disrupted markets. In the absence of new taxing or other fund-raising authority, those units must secure additional funding or petroleum allocations.

Nor does the free market make any provisions for low-income individuals who suffer particular distress when fuel prices go up. However, economists generally claim that price controls, with or without mandatory allocations, are an extremely inefficient way to meet this social concern. Controls and allocations affect rich and poor alike. Moreover, they exact a toll in the form of a poorly functioning fuel market and a loss of production and jobs that tends to fall disproportionately on the poor.

However, public policymakers worry about equity as well as efficiency. They may therefore choose to sacrifice some efficiency in order to improve equity. Such a choice may have underlain the decision to impose price ceilings and provided the rationale for a "need" to keep petroleum products relatively cheap.

A far more efficient way to aid low-income families is by transferring cash directly to them, allowing the recipients to spend it as they see fit. The source might well be general tax reve-

nues supplemented by proceeds from Strategic Petroleum Reserve and existing taxes on the oil industry. Even this apparently simple method entails complex problems. But, on balance, a good case can be made that the government can allocate money more efficiently than it can oil.

Rationing by coupon A proposal that was frequently made, though never put into practice, called for combining price ceilings in the gasoline market with coupon rationing as a way to avoid the searching, queuing, and general inconvenience of shortages. Coupons or rationing stamps equal to the available quantity of gasoline would be printed and distributed to the consuming public. The purchase of gasoline would require payment of the controlled price plus a designated number of coupons.

Studies of the feasibility of a coupon rationing program invariably conclude that it would entail enormous costs and serious administrative problems. The system would need to cover more than 100 million vehicle owners in the United States who use 100 billion gallons of gasoline a year. It would take three to nine months to install a coupon system. Administration would require a bureaucracy of at least 10,000 people and cost $3 billion–$4 billion annually. The value of the stamps would probably exceed the value of all U.S. currency in circulation and present a constant invitation to theft and counterfeiting.

Moreover, the number of coupons and the available quantity of gasoline would have to be matched by accurately forecasting each month's supply of gasoline—a formidable task. And while coupon rationing would cut down on the amount of searching and queuing at service stations, it would tend to create queuing at post offices or other coupon distribution centers and do nothing to compensate for the dampening effect that price ceilings have on gasoline supply. Nor is the use of coupon rationing likely to be required for an extended period, since even price-controlled markets soon tend to clear, as we have seen, by quality deterioration, transfer of unsatisfied demand to other markets, and the like.

Finally, it is most unlikely that any objective formula for distributing the stamps, such as an equal number to all vehicle owners or to all families, would be generally regarded as fair. A simple rule cannot take account of the vast differences between people's desire and ability to respond to a lowered supply of gasoline.

To meet this objection, almost all coupon rationing proposals permit a legal resale market for coupons, which would enable those with greater driving needs to buy necessary coupons in a legitimate "white market."

There are two major difficulties with a resale market for coupons, one concerning equity and the other efficiency:

1. For any initial distribution of coupons, however determined, the ability to resell them involves a transfer of income from those who drive more to those who drive less. It is not clear to what degree that income transfer would help or hurt the poor.

2. While coupons can move freely around the country in response to regional price changes, there is no comparable mechanism to enable gasoline supplies to follow the coupons. Gasoline prices would still be subject to controls that preclude price changes in response to changes in demand.

A rough tendency for gasoline to catch up with coupons would probably operate through ad hoc monitoring of the coupons, but that process would lack the efficiency and speed with which uncontrolled gasoline prices signal the exact location and quantity desired. The result would be unnecessary shortages in one market area and unneeded surpluses in another.

Price Controls in the Crude-Oil and Natural Gas Markets

We turn now to the raw material or crude-oil market and examine the impact of regulations there from 1973 to 1980. Following this, we will sketch the regulatory history of the sister industry, natural gas.

Controls in the Crude-Oil Market

As noted earlier, the United States had no ability to influence the price of imported oil directly. However, domestic crude-oil prices were automatically controlled as part of the 1973 version of general wage and price controls. In a short time, several categories of ceilings were imposed: a low price of $5.03 a barrel for oil already in production as of May 1973, first dubbed "old," later dubbed "lower-tier" oil; and the world price for oil newly produced after May 1973—"new" or "upper-tier" oil. Production from domestic stripper wells (less than 10 barrels per well per day) was exempted from controls.

The ceiling price on lower-tier oil was gradually raised during the 1970s. It reached $6.87 by the end of 1980. The ceiling on upper-tier oil followed the world price until December 1975; thereafter it was permitted to rise only slightly while, beginning in 1979, the world price soared. The upper-tier price was $15.06

at the end of 1980, less than half the world price of $35.00.

Holding the U.S. price of crude oil below the world level caused imports to increase as American users attempted to alleviate the resultant shortage. Earlier, in the free market, U.S. refiners found it cheaper to import some crude oil than to buy it from domestic producers. When the world price soared and domestic prices rose much less, the demand for domestic oil rose sharply. But the domestic price ceilings gave U.S. producers little incentive to produce more oil. This was mainly because production costs in an inflationary environment were rising rapidly. In addition, the ceilings were expected to be temporary. The result was an acute shortage of domestic crude. The unsatisfied demand was quickly diverted to the only place it could go, the market for imports.

The higher prices of oil, both domestic and foreign, served to reduce the quantity of crude oil demanded. But with the domestic price held artificially below the world price, total U.S. consumption of oil was met by imports to a greater degree than before. From an economic welfare point of view, there are two objections to this increase in imports. One objection is on grounds of efficiency alone: a secure source of supply—domestic crude oil—is replaced by a less secure source, imports. Another objection is on grounds of both efficiency and equity: the undesirability of transferring domestic wealth abroad in the form of monopoly profits.

Crude-Oil Entitlements

Soon after the 1973–1974 controls were imposed, U.S. refiners voiced a complaint. Refiners with access to the cheaper old oil had a price advantage over those who had to rely on imports. The refineries with access to old oil were more resourceful and had done a better job of planning for contingencies. The Federal Energy Agency, however, responded by devising an "entitlements" program under which all refiners, through a system of cash transfers at the end of each month, would end up paying the same price for oil—the average of domestic, old, new, and foreign—no matter what their actual mix of purchases. (Small refiners were given a disproportionately generous allotment of lower-priced oils.)

The main impact of the entitlements program went unnoticed at first. Because of the process of price averaging, imports were effectively sold for *less* than their actual price and were subsidized by domestic oil, which was sold for *more* than its actual price. Imports of oil increased dramatically under this system. It is no coincidence that when the oil controls were phased out, beginning in April 1979 and concluding in January 1981 with complete decontrol, imports of oil dropped as sharply as they had earlier increased. Overall, the effect of the crude-oil controls, including the entitlements, was to limit U.S. oil production, raise U.S. consumption of oil, and thus raise the level of imports.

Control in the Natural Gas Industry

The story of regulation of the oil industry is not complete without including the regulatory experience of the natural-gas producing industry. The industry is highly competitive. There are thousands of gas producers, no one of which dominates the industry.

In a law passed in 1938, Congress had intended to regulate the price of gas only as it emerged from interstate pipelines, whose owners might conceivably exercise monopoly power in delivering their product to gas utilities. But in 1954, the Supreme Court ruled that the rather loose wording of the law applied to the wellhead as well as to interstate pipelines.

The controls on national gas prices led to a severe shortage in the interstate market by 1970. Unlike the experience under gasoline controls, the shortage in natural gas did not result in much additional search activity, queuing, or deterioration in the quality of the product. Oil can be adequately substituted for most uses of natural gas, and the excess, unsatisfied demand for gas spilled over into oil. This raised the demand for oil just as world supplies were being restricted by OPEC. Meanwhile, U.S. natural gas production, as pictured in Figure 3, peaked in 1971 and declined thereafter at a rate of 2 percent per year—a consequence of the controls.

In 1978 Congress passed a bill which brought the previously uncontrolled *intrastate* natural gas market under the interstate price ceilings. Congress also placed all natural gas from wells that started producing after January 1, 1978, on a seven-year deregulation schedule. The ceilings on the intrastate market removed the incentive to produce new gas for that market only. As this was being written, however, there were questions about how well this deregulation scheme would work. The general effect of the controls on natural gas has been to deny the United States supplies of its cleanest and most plentiful domestically produced fuel by reducing incentives for producers to find more of it.

The artificially low ceiling prices diverted gas into uses that would not have been economically justified at free-makret prices. And the controls have played a role in luring industry away from the northern parts of the

country to the gas-producing sunbelt states, where gas (uncontrolled until 1978) was in plentiful supply.

The Adjustment to Higher Energy Prices

To most economists, the controls and regulations are the negative side of the U.S. response to the energy shocks of the 1970s. But there is also a positive side. The controls slowed the rise of domestic energy prices, but did not totally prevent it. And the price increases, both in the United States and abroad, brought on decreases in energy use and, by the mid to late 1970s, increases in the output of energy alternatives worldwide.

The Rise in Energy Prices

Energy prices, corrected for inflation, rose more in the United States between 1973 and 1980 than in any other major industrial countries, except Italy and Japan. From 1973 to 1980 the indexes of "real" energy prices at the final-user level rose 73 percent in the United States, 99 percent in Italy and 148 percent in Japan. The average rise was about 30 percent in other major countries.

These increases may seem modest compared to the twelve-fold rise of crude oil prices during this period. But the indexes include coal, natural gas, and electricity (a secondary energy source), whose prices rose much less than that of oil. And consumer prices—the standard against which the "real" final-user price is calculated—themselves approximately doubled in most of these countries.

Moreover, the cost of the primary energy source is only one component of the price of the energy delivered to users. In most countries, crude oil, for example, is a smaller part of the cost of petroleum products than is the combined cost of refining, distribution, and taxes. In the United States, however, the cost of the crude oil itself is a relatively larger component of the product cost because energy taxes are lower. This explains the comparatively steep percentage increase in oil and energy-product prices in this country even while controls held the absolute level of these prices below world levels.

The rise in world energy prices in the 1970s was due to a reduced growth rate in the production not only of oil, but of natural gas and nuclear power as well. The worldwide energy supply dropped from an annual growth rate of 4.9 percent in 1969–1973 to 2.2 percent in 1973–1980, a drop of more than 50 percent. Most of this decline—apart from the complete lack of growth in OPEC oil production—was accounted for by the absolute decline in the U.S. output of both oil and natural gas. (While the United States produces only about a seventh of the world's oil output, it produces almost 40 percent of the world's natural gas.)

The Response in U.S. Energy Use

Meanwhile, the consumption of energy in the United States dropped from a growth rate of 2.9 percent per year in 1969–73 to a minuscule 0.2 percent in 1973–80. This was a greater reduction than in any other industrial country except Japan.

The consensus among economists is that half or more of the reduction in U.S. energy use is explained by the rise in prices, particularly in the oil-decontrol period that started in April 1979. The remaining reduction is due to the decreased growth of real income in the years after 1972. There is no documented evidence that government conservation programs, such as mandated fuel-efficiency standards in automobiles or tax deductions for home insulation, or the exhortations of political leaders, energy officials, or religious leaders had any significant impact on America's use of energy. There is, by contrast, solid evidence from the analysis of economic statistics that the rise in gasoline prices, if permitted to occur earlier, would have induced an increase in the fuel efficiency of automobiles equal to or greater than that mandated by law (see reference 3*).

The Response of U.S. Energy Production

The production of Alaskan oil, which began in 1976, was a response primarily to the political decision to build the Alaskan pipeline. Thus, a better picture of the effect of market forces on supply is given by the production of oil in the lower 48 states: an average decline of 3.8 percent per year from 1973 to 1979 and a 2.6 percent decline in 1980, following the onset of decontrol. However, the 0.5 percent increase in 1980 in all U.S. oil production, including Alaskan, can be regarded as a pure response to the increase in price (see Figure 3).

Total U.S. energy production in all forms of fuel rose from 1949 to 1972 at 3.2 percent per year. From 1972 to 1975 the trend was downward at 1.5 percent per year. In 1976 total energy production was essentially flat, but from 1976 to 1980 it increased at an average rate of 1.9 percent per year. That four-year increase was due mainly to the addition of Alaskan oil

*Numbers refers to Bibliography at end of this overview.

in 1977 and 1978, to tapering off of the decline in the lower 48 states' oil output, and to significantly increased coal production in 1979 and 1980 (Figure 3).

Weak consumption, weak imports, weakening prices By the end of 1982, U.S. petroleum consumption had fallen 11 percent below the 1980 level, partly because of the economic recession. Since U.S. crude-oil production in 1982 was slightly above that of 1980, the fall in consumption came entirely out of imports. At the end of 1982 oil imports were lower than they had been since 1975; they were 27 percent below their average 1980 level. This decline in demand was accompanied by a dip in prices as 1982 ended. In fact, the real price of gasoline was 10 percent lower at the close of 1982 than it was at the close of 1980.

In March 1983, despite previous cutbacks in oil output in order to maintain its price, OPEC for the first time reduced its official selling price. The cartel's members decided to cut the price of the basic grade—Saudi Arabian light crude—from $34 to $29 per barrel. At the same time, production quotas for practically all the OPEC nations were increased somewhat. Saudi Arabia, by far the biggest producer in OPEC, agreed to be the "swing" country, that is, the Saudis agreed to adjust their petroleum production in line with the amount of OPEC production the market would absorb at the $29 price. Saudi Arabia had already reduced its output from somewhat more than 10 million barrels a day during much of 1981 to 3.8 million a day just before the March 1983 agreement was reached.

Given the tensions within the cartel, worldwide energy conservation, increased supplies from non-OPEC producers, and the lack of vigorous world economic growth, there was uncertainty as to whether the $29 per barrel price would hold or fall further.

Energy and Inflation

Oil price controls and mandatory allocations caused the inflation rate to be higher than it would otherwise have been. Energy prices exert their main impact on the price level of all goods and services by influencing the total supply of output. This reduction in crude-oil inputs reduced the supply of almost all final goods and services. Controls and mandatory allocations exacerbated this supply effect by preventing the available oil from going to its most valued (GNP-augmenting) uses. Economic simulations indicate that the rise in energy prices has been responsible for three or four percentage points of the 12–13 percent inflations in the United States in 1974 and 1979–80. Energy prices have not otherwise played a causal role in the inflation of the 1970s (see references 22–24 and 27).

Government Energy Policy for the Future

The weakening of the OPEC cartel and the possibility that it may eventually founder do not lessen the need to consider what future U.S. energy policy ought to be. In the early 1980s, energy policy revolved around two issues: (1) the transition to alternative energy sources and (2) planning for contingencies. The underlying question in both cases is the appropriate division between government and private-sector responsibilities.

General Economic Aspects

Economics traditionally defines the task of government in providing efficiency as one of establishing and enforcing property rights and intervening further into individual markets only in cases of market "failure,"—that is, circumstances in which the market price and quantity fail to reflect accurately production costs or total benefits to society.

Within that framework, government intervention takes the form of regulating the price charged by "natural" monopolies—firms, such as certain utilities, whose costs decline over the entire relevant range of their operation; of imposing taxes or other charges on prices too low to cover the cost of using resources that are not (and cannot be) privately owned—such as the air and almost all waterways; and of subsidizing the production or stimulating the consumption of goods—such as education and national defense—whose benefits are not limited to those who voluntarily pay for them. The government also intervenes to remove barriers to entry of new firms into an industry. By so doing, government prevents existing firms from charging monopoly prices.

In all of these cases, the government's action alters the price and quantity so that they will conform more closely to actual costs and benefits, including those borne by third parties not involved in the transaction. In none of these cases is there an implication that government itself must enter the market as a producer of the goods or services in question.

Energy Aspects

With the exception of a few limited, though important, taxes and subsidies described below, there is no broadly accepted economic ra-

tionale for government intervention in the production and consumption of energy. At the same time the private sector has an unexcelled historical record of developing new energy sources in response to market signals. In recent decades private venture capital has successfully developed offshore oil—including that in Alaska and the North Sea, and the Alaskan pipeline—under some of the most inhospitable and hazardous natural conditions ever encountered. There is no evidence that the responsiveness of energy supply to increases in price is less vigorous today than it has been in the past.

The ultimate resource base An alternative view usually asserts that the world is running out of fossil fuels and that the U.S. government must therefore spearhead a crash program to find substitutes. Although the total reserve of oil, gas, and coal is finite, we do not really know what the ultimate availability is. Neither geology nor economics is able to answer that question; all past attempts to do so—the most sincere and the most frivolous alike—have proved to be wildly inaccurate.

Predictions of future availability are usually based on the extrapolation of existing proved reserves. And today's proven reserves are based on prices and technology in use years ago. The ultimate available resource base depends at least as much on future prices and technology as on physical limits, all of which are simply unknowable.

The market mechanism and its critics Fortunately, we do not have to know the unknowable before answering the critical question: What is the appropriate mechanism for assuring the energy sources of the future regardless of the degree of present resource exhaustion? It is the marketplace. Economic historians point out that any tendency to more rapid resource depletion is reflected in rising energy prices. In the past, including the recent past, we have seen the uncontrolled segments of the market respond to the higher energy prices, whatever the cause, in a manner that has served both the private and social interest. On the side of consumption, endless measures of reduced energy use have been devised, developed, and gradually put into use as the old capital stock—buildings, automobiles, appliances, machinery—has depreciated and been replaced by less fuel-intensive alternatives. On the side of production, producers of existing and potential energy sources have engaged in a massive trial-and-error endeavor to create the least-cost fuels of the future, again in response to the higher price of energy.

Some critics of the free market claim, however, that it is capable of serious error in assessing new technologies and anticipating future needs; that present prices may not accurately reflect future danger. Market advocates believe it is even riskier to rely on government initiatives and regulations, which limit price signals and displace the multitude of signals emanating from the many producers and consumers normally present in the market.

Government regulation tends to discourage the thousands of private experiments aimed at conserving energy and producing additional amounts from sources ranging from the conventional to the utterly improbable. Precisely if the world is "running out" of, or rapidly depleting, its known resources, market advocates see the decentralized market process as the most promising approach. In times of increasing energy scarcity and uncertainty, the world needs all the help it can get.

A compromise approach, advanced by the Carter administration in 1977 and favored by those who believe that the price signals may be insufficient, is to levy a tax on crude oil or coal or on energy products such as gasoline and jet fuel. All such taxes raise the price to the consumer and reduce energy use. While the tax would thus discourage present types of energy production, the revenues could be rebated—as subsidies, loans, and loan guarantees—to a wide range of alternative types.

The intent of the oil windfall profits tax of 1980 was to provide funding for new energy sources. However, as frequently occurs in politically oriented decisions, money raised for the designated purpose was spent on another.

Although the tax is designed to capture windfall profits following decontrol, it is actually an excise tax levied on the price of oil. The result has been that production of oil initially selling at $2 and $3 a barrel a decade ago is undeterred by the tax, but production from more recently developed wells is almost certainly less than it would be in the absence of the tax (see reference 15).

The limitations of government involvement From a market perspective, government is not constituted to perform efficiently as an actual producer or arbiter of economic output. By suppressing or insulating itself from market-determined prices, it lacks the information and incentives required to find least-cost production methods and to produce or to encourage the production of goods in the amounts and varieties that consumers desire. Government's economic position is that of a monopolist, an economic species uniquely unqualified to undertake or guide innovative economic ventures. As entrepreneurs, governments are naturally conservative, averse to risk, heavi-

ly influenced by regional and narrow political interests, and subject to time horizons of notoriously short duration—the horizons are often no longer than the interval between elections.

A catalog of past government failures in energy would include more than the federal price ceilings and allocations for oil and natural gas, but the earlier state "market-demand prorationing" quotas that limited—in cartel fashion—the oil output of producers in several of the larger oil-producing states from the 1930s until the early 1970s. There also have been a number of tax advantages for the oil industry, including the percentage depletion allowance (until 1975) and generous deductions for drilling dry holes, leading to uneconomic search and drilling activity; mandatory oil import quotas, which maintained domestic oil prices above world free-market levels throughout the 1960s and early 1970s; and the promotion of the nuclear power industry, particularly through the $560 million limitation on the liability for damages by nuclear plants, mandated by the Price-Anderson Act (see reference 36).

We will pay the penalty for many years to come for the misleading signals provided by Price-Anderson, which lowered the opportunity cost for nuclear plants to locate near large population centers (New York City) and on earthquake faults (in California) and to employ less rigorous safety procedures at Three-Mile Island and elsewhere. However, the lengthening of the licensing procedure and construction period for nuclear plants to ten, twelve, and more years must also be added to the list of government failures in energy policy.

There is always the risk that government involvement will politicize energy markets, and allow political influence to determine the choice of energy alternatives. The emergence of strong solar and synthetic fuel lobbies poses just such a danger, no different in principle from that of the nuclear lobby that developed in the 1950s.

A positive role for government Government should limit its energy initiatives to correcting demonstrable cases of market failure unlikely to be succeeded by even costlier cases of government failure. There are only two activities that clearly qualify for government involvement. One is basic or "pure" research, which in all fields tends to be underproduced by the market because of the technical inability to establish strong property rights in it. The second activity requiring a government presence is contingency planning. There are costs and benefits in preparing for possible disruptions in world energy supplies that the private sector will not fully incorporate in its decision making. Government must therefore play a role in funding and developing a reserve of petroleum and possibly of other fuels. An alternative method of reducing U.S. vulnerability to oil-supply disruption is for government to impose a tariff on petroleum imports.

Is there a case for controls? On the basis of our analysis, the avoidance of price controls and allocations in disruptions, as at all other times, is a primary task of government. Our straightforward application of mainstream economics uncovered endless costs and virtually no net benefits under the energy control and regulatory network of the past several decades. Yet the controls were—at least, initially—clearly popular and would very likely be invoked under similar circumstances in the future. Are there benefits from the controls that a narrow economic perspective tends to overlook?

Taking a broader view, one might argue that price ceilings and centrally mandated allocations calm the public and avert panic among ultimate consumers. While the hasty and impromptu petroleum allocations drawn up in 1973–74 and 1979 were themselves the result of administrative panic, it is possible that unexpected and uncontrolled domestic price increases would have abraded the social fabric even more. There is no serious doubt that the crucial oil-producing decisions of the 1970s were made by the OPEC governments and no one else. But as long as the public believed that domestic oil companies were even partially responsible for the oil crisis, it is doubtful that any U.S. administration could have permitted complete market freedom and survived.

The argument that equity, especially for the poor, was served by the controls is unconvincing, even on the surface. Gasoline and other oil products, priced below market-clearing levels, were accessible to all economic groups, the largest of which is the American middle class, not the poor. That low gasoline prices were desired by middle class Americans is both clear and understandable, given the economic importance of the automobile in the United States. But whether the controls actually lowered the effective price of fuel to the poor or anyone else is far from clear.

It takes some sophistication to realize that even though OPEC triggered the supply restrictions, U.S. price ceilings and not OPEC were responsible for the resulting failure of markets to clear rapidly and smoothly at higher equilibrium prices. Market-clearing was accomplished in most major European countries and Japan, although those countries were much more dependent on OPEC supplies than the U.S. was during the 1970s disruptions.

Conclusion The role of government in contingency planning would appear to be not

only to avoid imposing price controls and mandatory allocations, but to try to create the environment in which basically free-market allocation is politically and socially feasible. Even if it could be shown that controls are psychologically stabilizing during a crisis, their costs are large; moreover, their almost inevitable tendency to remain indefinitely in force undermines the long-run development of optimal energy sources and uses.

A constructive role for government would entail:

1. Aggressive and rapid buildup of the national Strategic Petroleum Reserve, particularly in times of a slack oil market, and a ready plan to draw down that reserve in emergencies through competitive auction. Most studies of the costs and potential benefits of a reserve support a minimum size of 1 billion barrels. At the close of 1982, the reserve contained 300 million barrels; construction capacity for 200 million barrels was under way with completion scheduled for 1985. Authority for another quarter-billion barrels existed, but had not been acted upon.

2. Development of a detailed plan for transferring some of the potentially enormous revenues from taxes on the oil industry to lower-income families and individuals and state and local governments during oil disruptions. A 1981 Congressional initiative to do just that received no administration support.

3. An all-out effort to help the public understand the nature of oil disruptions and the inevitable problems with controls, while government itself avoids blaming businesses and engaging in other panicky, inflammatory, and divisive actions during crises.

4. A government policy and posture which convinces the public that Washington will follow a consistent energy policy, despite short-run relaxations or exacerbations of the "energy crisis."

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GLOSSARY

ALLOCATION. The distribution or assignment of resources or goods to different uses or users. Allocation by *price* occurs when buyers and sellers interact freely to determine a total quantity of a good, a single price for it, and a distribution of the quantity among buyers that simultaneously satisfies all participants—given the sellers' production costs, the prices of alternative commodities, and the buyers' incomes and tastes. *Nonprice* allocation occurs when prices fail to rise to market-clearing levels and the total quantity of the product supplied is allocated by impromptu methods, such as queuing or arbitrary limitations on the quantity that can be sold to each buyer, or by government authorities who invoke *centralized* or *mandatory* allocation, such as a priority-user classification or an historical-use pattern. *See also* OPTIMAL ALLOCATION.

B.T.U. British Thermal Unit. This is the common measure of energy. A B.T.U. is the amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit. Diverse fuels, such as oil, coal, and natural gas, are compared quantitatively on the basis of the number of B.T.U.'s a unit of each is capable of generating.

CARTEL. A group of many sellers of a given product who, by agreement, act collectively to reduce their individual outputs and raise the market price above the competitive level. Their actions are effective only if they control a significant portion of the total sales, if they can impose and enforce output limitations or "quotas" on each member, and if there are no close substitutes for the product.

CEILING PRICE. A price, usually set by government below the market-clearing price, above which transactions cannot legally be carried out. Occasionally ceiling prices are set above the market-clearing price and therefore are not observed and do not directly affect transactions in the market.

COMMAND ECONOMY. An economy in which resources and goods are allocated by directions issued from a central authority. See also CENTRALIZED *and* MANDATORY *under* ALLOCATION.

DEMAND. A schedule showing, at each possible price, the quantities of a given commodity people are willing to buy; or, at each possible quantity, the prices people are willing to pay—given their tastes, incomes, and prices of alternative commodities. The quantity demanded increases as prices fall, or, equivalently, the prices that people offer to pay decrease as the total quantity increases.

EFFICIENCY. *See* OPTIMAL ALLOCATION.

EQUILIBRIUM PRICE. *See* MARKET CLEARING PRICE.

EQUITY. Fairness or justice.

EXCESS OR UNSATISFIED DEMAND. At any given price (often a ceiling price), the quantity demanded minus the quantity supplied. When positive, this difference is referred to as a *shortage;* when negative, as a *surplus* or *excess supply.*

GNP. Gross National Product: a country's annual total output of goods and services valued at market prices. However, not all economic activity takes place in the market. Two major nonmarket sectors are the work effort within the home by family members—particularly housewives—and the activities of government itself, such as the armed forces. To be included in the GNP, these nonmarket contributions must be valued by other than market prices. In the case of the armed forces, the contribution to GNP is measured by the dollar outlay on military salaries and supplies. No attempt is made, however, to measure the value of unpaid household labor and it is omitted from the GNP. *Per capita GNP* is a country's GNP divided by its total population. *Real GNP* is a country's GNP adjusted to hold the average price of goods and services constant. This is done by valuing the physical output of all goods and services by the prices of a given period.

MARKET CLEARING PRICE. The price at which the total quantities supplied and demanded are equal; or, equivalently, the price at which the supply and demand schedules intersect. Also referred to as the *equilibrium price.*

MARKET ECONOMY. An economy in which suppliers and demanders freely interact to determine the allocation of resources and the output of economic goods, using prices to signal changes in underlying conditions.

MARKET PRICE. The price of a resource, commodity, or service actually prevailing between buyers and sellers.

Monopoly. A producer of a product who is the only seller of it. The monopolist is able to increase profits by reducing output below, and charging a price above, the competitive level. Pure monopoly is very rare, but approximations to it can occur, as when one or more large firms collude and agree to limit their combined output, or a firm in an isolated area may be able to exercise a degree of monopoly power (or *market power*, as it is often referred to) by restricting output. While firms with monopoly power produce less and charge more, they are nevertheless responsive to demand changes, raising price and output when demand increases, and lowering price and output when demand decreases. A failure to raise or lower both prices and output in response to demand shifts would mean that the monopolist was not maximizing profits.

OPEC. The Organization of Petroleum Exporting Countries: a consortium of some of the world's largest oil producers, including most of the producing countries surrounding the Persian Gulf and in North Africa (Libya and Nigeria), Venezuela, Ecuador, and Indonesia. Widely referred to as a "cartel," there was very little evidence of cartel behavior by OPEC until the early months of 1982, when, for the first time, it began assigning production limits to its members in a market of weak demand and falling prices. Throughout most of the 1970s, OPEC conformed to the economist's "dominant firm" model, in which most firms are quite competitive, producing as much as they wish at prices they take as given, and only one or two large producers, the dominant firms, restrict their output so as to raise the market price. Saudi Arabia, the largest producer and dominant firm, exercised little or no production control over other members of OPEC throughout the 1970s.

Opportunity Cost. This is the concept of cost employed in economics and is the value of the highest-valued alternative output that is given up as a result of allocating resources to the output of a given commodity.

Optimal Allocation. An allocation of resources which, for given prices, minimizes total costs, or, equivalently, for given quantities of imputs, maximizes total output; or, an allocation of goods which, for given prices and quantities, maximizes consumer satisfaction. Such allocations are also economically *efficient*.

Profit Margin. The amount remaining from the price of a commodity after subtracting payments for labor, raw materials, interest on loans, depreciation allowances, and taxes.

Queue. A waiting line.

Refinery. A manufacturing plant that converts raw crude oil into various petroleum products, essentially by heating and distilling the oil. Lower temperatures will produce the "heavier" products, such as boiler fuel and heating oil, while higher temperatures will create "lighter" products, such as jet fuel and gasoline.

Resources. Anything of limited supply—raw materials, minerals, human labor, structures, land, etc.—capable of being used to produce economic goods. Also known as *productive services* or *inputs* and *factors of production*.

Shadow Price. The value consumers place on the existing quantity of a commodity, when, for various reasons, the value is not equal to the actual or market price.

Supply. A schedule showing, at each possible price, the quantities of a commodity firms are willing to produce; or, at each possible quantity, the prices that must be paid to cover the costs of producing each additional quantity—given the prices of resources and the state of technology. Since the cost of each additional unit rises as the quantity supplied increases, higher prices must be paid to cover the costs of increased quantities; or equivalently, as price increases, a greater quantity will be supplied.

Technology. The available knowledge and skill used in combining resources to produce goods and services.

Topping. The practice of motorists to keep their gasoline tanks as full as possible while a gasoline shortage exists in order to protect themselves against the possibility of running short and being unable to find any source of supply.

II. Teaching About the Economics of Energy

NOTE: Teachers of classes with little or no background in economics may wish to start with lessons 7 through 11.

Instructional Activity 1

SHORTAGES, SHORTAGES, SHORTAGES

OVERVIEW

Failure to distinguish scarcity from shortage has had serious energy policy implications. The problem of scarcity is managed by the market. Shortages persist when the market is not allowed to manage the scarcity problem. The following activity is designed to help students understand this distinction and its policy implications.

CONCEPTS Demand; supply; scarcity; shortages; market clearing price; price control

MATERIALS NEEDED Handouts 1-1 and 1-2 and Visual 1-1; optional: hand calculator for Procedure 3.

OBJECTIVES Students will

- Construct a graph showing the demand and supply for Pac-Man plays in their neighborhood;
- Use the graph to determine the market clearing price for Pac-Man plays and to describe the conditions that would result in a shortage or a surplus;
- Distinguish between economic scarcity and shortage;
- Apply the concepts learned from the graphing exercise to analyze problems related to the allocation of energy products.

PROCEDURES

1. Distribute Handout 1-1.
2. Ask students to complete the individual demand schedule by writing the number of games of Pac-Man they would play during a school day at each price shown.
3. Use the individual demand schedules to establish a demand schedule for the class. Write the class demand schedule on the board.
4. Have students individually plot the class demand curve on their handouts.
5. Distribute Handout 1-2 and allow several minutes for students to study the example given at the top of the page and the resultant supply curve (vertical line labeled S) shown on the chart.
6. Help students develop the scenario of a fixed quantity of Pac-Man plays. Ask: How many machines are there in the neighborhood? Have students use this number, along with the number of hours the machines are available to students for play, to calculate the fixed quantity supplied of plays.
7. Have students draw the fixed quantity supplied on the graph in Handout 1-1.
8. Ask: What is the price at which the class demand curve and the supply curve intersect? Check to see that students' graphs show the same intersect point, then ask: What is the economic term used to describe the point at which the demand and supply curves intersect? *(The market clearing price.)*
9. Project Visual 1-1.
   a. Tell students to assume that D and S_1 represent the demand and the supply curves for Pac-Man.
   b. Ask: What is the market clearing price when the supply is S_1? *(25¢)*
   c. Explain that at all prices below 25¢ the quantity demanded exceeds the quantity supplied. This is a shortage.
   d. Point to S_2 and ask: What happens to the market clearing price when the supply decreases from 600 plays to 450 plays? *(The price increases to 40¢.)*
   e. Explain that if supply decreases then the price must increase if a shortage is to be avoided. Then ask: What would happen if the supply decreased to 450 plays and the price remained at 25¢? *(There would be a shortage.)*
   f. Ask: What would happen if the supply remained at 600 plays and the price was increased to 40¢ with no change in demand? *(There would be a surplus because the quantity supplied would be greater than the quantity demanded.)*

This activity was prepared by DeVon L. Yoho.

10. Use the following questions for class discussion of the demand-supply graph students constructed for Handout 1-1.

    a. As the price increases what happens to the quantity demanded? *(Quantity demanded decreases.)*

    b. What is scarce? *(The number of Pac-Man video game machines, time, and income.)*

    c. What determined the market clearing price? *(Since supply was fixed, the market clearing price was determined by market demand.)*

    d. What would happen if the price were set below the market clearing price? *(Some buyers would be unable to buy all they wanted at the controlled price. A shortage would exist but relative scarcity would not change. The same number of Pac-Man plays would still be available.)*

    e. Can the shortage be eliminated? Why or why not? *(Yes. If buyers are allowed to bid up the price, the market would again clear.)*

    f. Can the relative scarcity of Pac-Man be eliminated? Why or why not? *(No. The resources used to produce Pac-Man plays are limited.)*

    g. Since basic market analytics also apply to crude oil, ask the preceding questions again, substituting oil for Pac-Man plays.

Instructional Activity 2

PRICE CHANGES; BUYER AND SELLER BEHAVIOR

OVERVIEW

Both buyers and sellers change their behavior as a result of price changes. When the price of oil increased substantially in 1973 and again in 1979, buyers eliminated the uses of oil that were of less value to them. Where possible they substituted other fuels and/or more fuel-efficient cars, plants, and equipment. Oil price decreases, too, will change buyer and seller behavior.

CONCEPTS Demand; supply; market clearing price; substitutes

MATERIALS NEEDED Handout 2-1

OBJECTIVES Students will

- Apply the principles of demand and supply to explain the decrease in the price of oil;
- Describe the effects of the price decrease on the behavior of buyers and sellers.

PROCEDURES

1. Distribute Handout 2-1 and allow time for reading.
2. Discussion Questions:
   a. Is oil scarce? Why or why not? *(Yes. Not only is crude oil itself limited but the human and nonhuman resources used to find, extract, and distribute it are scarce.)*
   b. Why has the price of oil declined? Has supply increased? Has demand decreased? *(The price of oil has decreased because the supply has increased due to new discoveries of oil. In addition demand has fallen because of the recession as well as more efficient use of oil. The decline in price is due to changes in demand and supply.)*
   c. According to the article, what are the disadvantages to the oil price decline?
      - More oil will be used. Conservation will thus be curtailed to some extent. Consumers may not shift as rapidly to fuel-efficient cars. Businesses may change to other fuels less rapidly.
      - The incentive to explore for additional oil may decrease.
      - Capital market disruptions are likely as OPEC member nations draw down surplus funds.
      - Political instability may increase in the Middle Eastern and North African nations.
   d. Are there advantages to the oil price decrease? *(Yes, a lower rate of energy product cost reflected in lower prices for other products and a more balanced recovery from the recession. In addition, the market power of OPEC is reduced.)*
   e. On balance, how do you evaluate the effects? *(Answers may vary. Be sure to point out that market forces create price signals that cause buyers and sellers to change their behavior. Such changes assure a market clearing price.)*

EXTENSION ACTIVITIES

1. Ask students to collect current news articles dealing with energy. Use the articles to draw conclusions regarding changes in demand, supply, government policies.
   Hypothesize about how the changes mentioned above might affect market clearing price and future demand and supply. Use graphs to show the effects.
2. Name a product whose price has changed recently. Ask students to conduct a consumer behavior survey to find out how buyers change their market behavior when prices change. The following questions may be asked during the interview:
   a. Has the price of (product and/or service name) changed in recent weeks? If yes, ask in what direction and by how much?
   b. If the change has been recognized by the respondent, ask, "Has the change affected your purchasing choices?"
3. Have students use the collected information to show how buyers react to changes in a product price.

This activity was prepared by DeVon L. Yoho.

Instructional Activity 3

WHICH ENERGY SOURCE?

OVERVIEW

Energy can be produced from many sources. Determining what source to use is an economic decision. The source selected for a particular final use depends on the relative cost of the energy source and the characteristics of the product in its final form.

CONCEPTS Resources; cost

MATERIALS NEEDED None

OBJECTIVES Students will

- List the attributes of energy required for various uses such as heat, light, etc.;
- Name the sources from which energy is produced;
- Give examples of how relative cost and the attributes of energy products influence the selection of an energy source for a particular final use.

PROCEDURES

1. Ask students to list the attributes of energy they require for various uses; e.g., heat, light, motion, communication. The students might list "dependable," "clean burning," "easy to use and store" as desirable attributes of energy used for heating.
2. Have students list the variety of sources from which energy and thus its attributes can be produced, including crude oil, natural gas, coal, hydroelectric power, nuclear reactors, solar power, grain distillation, wood burning, and wind.
3. Use the questions below to help students determine how the sources of energy are used.
   a. What is the primary source of energy for private transportation? *(Gasoline has been developed as the primary source of energy for private transportation.)*
   b. Why is this source of energy used when there are other possibilities? *(Gasoline is the primary source of energy for private transportation because of its relatively low cost of production and its physical characteristics: it is easy to distribute, it is portable, and it provides power for motion in a relatively efficient manner.)*
   c. Are there alternatives? *(Yes, e.g., electric motors powered by storage batteries or directly by solar energy.)*
   d. Have the alternatives been used extensively? *(No. The electric car involves a higher relative cost of production. It is less efficient to operate, especially for long distances. More research is required before the electric car can provide private transportation at a cost equal to or less than that of the gasoline-powered car.)*

EXTENSION ACTIVITIES

1. Repeat the questions in procedure 3 above for electricity, the major final form of energy for home use.
2. Invite a utility company representative to discuss how it decides what source of energy to use in generating electricity.
3. Help the students to reach the following summary conclusion: the choice of one resource over others depends on comparing the relative cost of using each resource and then selecting the resource that provides the desired energy attributes at the least cost.

This activity was prepared by DeVon L. Yoho.

Instructional Activity 4

STANDBY PETROLEUM ALLOCATION ACT

OVERVIEW

Can the market effectively handle the allocation of crude oil during a "large-scale disruption" of supply? The debate continues with arguments pro and con. The administration and Congress often disagree. This activity will help students to assess the arguments and reach a conclusion.

CONCEPTS Price controls; market allocation; efficiency; economic equity

MATERIALS NEEDED Handouts 4-1 and 4-2

OBJECTIVE Students will analyze policy alternatives for allocating scarce energy resources.

PROCEDURES

1. Distribute Handouts 4-1 and 4-2. Allow time for reading.
2. Divide the class into two groups. Designate one group to represent the Reagan administration and the other group to represent the U.S. Congress. Instruct the groups as follows:
   a. Using information provided in the handouts and other current information each group is to prepare an argument on the allocation of petroleum supplies (The Standby Petroleum Allocation Act) from the perspective of the government branch the group represents.
   b. Each group is to select one person to present its argument.
3. Have the group representatives present their arguments to the class. Depending on the talents of the students, this can be done through formal debate, interview by a panel of students representing news reporters, or some other format.
4. Conduct a class discussion, using questions such as the following to help students clarify the issues.
   a. What is the strongest argument for crude oil price controls? For no price controls?
   b. If the market is allowed to allocate the supply during a "large-scale disruption," price will temporarily increase. Is the price increase desirable or undesirable? Why?
   c. If the major concern is equity, do we have policy alternatives other than price controls?
   d. Should social concerns affect market decisions?

EXTENSION ACTIVITIES

1. Invite representatives of the oil industry, labor, and consumer groups to discuss oil price controls.
2. Obtain a copy of the congressional hearing for the Standby Petroleum Allocation Act. Ask students to analyze it to determine and categorize the major concerns, e.g., economic security (income stability), economic stability (price increases), economic justice (equity, fairness), economic freedom, or economic efficiency.

This activity was prepared by DeVon L. Yoho.

Instructional Activity 5

EFFICIENT USES OF ENERGY

OVERVIEW

Buyers adjust their consumption activity to the structure of relative prices. When energy prices are low relative to other goods, individuals choose to use energy for lower-valued uses. Even for these uses, the value is greater than the price paid. Consumers adapt their use of energy to its lowest relative price.

CONCEPTS Money as a measure of value; maximization of consumer satisfaction

MATERIALS NEEDED See Procedure 1 below.

OBJECTIVES Students will

- Describe how the structure of relative prices affects uses of energy;
- Cite specific instances in which the structure of relative prices has resulted in more efficient uses of energy.

PROCEDURES

1. Bring to class several labor-saving devices, e.g., electric can opener, electric tooth brush, electric pencil sharpener, etc. Have students examine the items. Then ask: Does the use of these devices waste energy? Why or why not?
2. Ask students to describe what they believe to be wasteful uses of energy. List student suggestions on the board without initial discussion. Select several items on the list and have students determine why each is considered a wasteful use of energy.
3. Discussion Questions:
   a. What helps to determine buyer behavior? *(The structure of relative prices.)*
   b. How do buyers react to a decrease in energy prices relative to the prices of other goods? *(Buyers are willing and able to use more energy. In order to maximize satisfaction, some of the additional energy will go to lower-valued uses.)*
   c. Are the lower-valued uses of energy wasteful? *(Not as long as the satisfaction gained is greater than the price for energy relative to the prices of other goods.)*

EXTENSION ACTIVITIES

1. Oral history. Select three volunteers to tape-record interviews with one or more of the following: a consumer, business executive, or government agency manager. The interviewer should ask the respondents to reflect on how they adjusted to higher energy prices. Ask respondents to speculate on their consumption behavior after an energy price decrease. Students should analyze the recorded information to determine what the respondents perceived as the lower-valued uses of energy.
2. Ask the students to write an editorial on the economic concepts affecting the uses of energy.

This activity was prepared by DeVon L. Yoho.

Instructional Activity 6

REAL PRICE OF ENERGY

OVERVIEW

During the eighty-year period 1890–1970, the real price (adjusted for inflation in terms of 1890 dollars) of crude oil in the United States rose from 77 cents a barrel to 82 cents a barrel. During the twenty-year period 1950–1970, the consumption of energy almost doubled. In the same period the price of energy declined by 20 percent relative to the prices of other goods. The decline in the real price of energy products resulted from increases in supply that were greater than the increase in demand.

CONCEPTS Real price; demand; change in demand; supply; change in supply

MATERIALS NEEDED Handout 6-1

OBJECTIVES Students will

- List factors that contributed to a change in the demand for energy between 1950 and 1970;
- List factors that contributed to a change in the supply of energy during the same twenty-year period;
- Describe the effect that the changes in demand and supply had on the real price of energy.

PROCEDURES

1. Distribute Handout 6-1. Instruct students to read the handout and answer the questions.
2. Have students discuss their answers.

a. Why did the consumption of energy almost double in the twenty years from 1950 to 1970? *(Demand almost doubled due to rising incomes and increasing population. The price of energy delined, because supply increased more than the increase in demand. The decline in price encouraged an even greater increase in consumption.)*

b. Why did the supply shift substantially? *(Low-cost crude oil from the Middle East became available during this period. In addition, technological changes helped to increase production from existing sources of crude oil at a lower cost per barrel.)*

c. How was it possible for the price of energy to fall by 20 percent during the twenty-year period although demand went up? *(The decline in price resulted from increases in supply which were greater than the increases in demand.)*

EXTENSION ACTIVITIES

1. Ask students to determine what has happened to the real price of energy since 1973. In particular, they should be able to find data on the consumption and real price of gasoline. Be sure to aid students to understand that the price of energy relative to other goods helps to determine changes in the patterns of consumption.
2. Ask students to explore the role of OPEC in bringing about the changes in real price and consumption since 1973.

This activity was prepared by DeVon L. Yoho

Instructional Activity 7

SPREADING CONSEQUENCES
Team Activity/Discussion

CONCEPTS Interdependence; secondary market effects; price changes; demand changes; supply changes

OBJECTIVES Students will

1. Predict the economic consequences of the changes in the supply of energy.
2. Predict the economic consequences of major changes in the price of energy.
3. Work together in small groups to analyze an economic problem.

MATERIALS NEEDED Chart (butcher) paper and felt marking pens for each group.

PROCEDURES

1. Divide the class into four or six teams. Provide each team with a sheet of butcher paper and a felt marking pen, then give the following instructions:
   a. Half of the teams will answer the question "What will happen to the quantity of petroleum demanded if the price increases substantially?" The teams will then list the consequences of a significant price increase in petroleum on energy markets and on the total economy.
   b. The remaining teams will answer the question "What will happen to the price of petroleum if the supply of petroleum is increased significantly?" They will list the consequences of a lower petroleum price on energy markets and on the total economy.
   c. Each team should write the question assigned to it across the top of the sheet of butcher paper. The team should then divide the lower part of the paper into two columns, one labeled Energy Markets, and the other labeled The Total Economy.
   d. The lists developed by each team should explain who or what in the economy is affected and how.
   e. The teams will be allowed 15 to 20 minutes to discuss the question and to complete their lists.
2. Have the teams place their lists in the front of the room so as to be visible to the entire class.
3. Ask students to examine the lists to determine the number and types of affected groups each team recorded.
4. Discussion Questions:
   a. Are there other groups affected that are not on the list or do you disagree with the designation of any of the groups that have been specified?
   b. Are there major differences between lists for price increases and lists for price decreases?
   c. Are all of the people on the list affected equally?
   d. Which change do you think would have the greatest impact—a price increase or a price decrease?
   e. Given a significant price increase in energy, what problems would be created for us to solve?
   f. Given a price decrease, would there be problems for us to solve?
   g. Would a member of your family be affected by either an increase or a decrease in the price of petroleum? If so, how?

This activity was prepared by Kenneth E. Leonard.

Instructional Activity 8

ENERGY-DATA ANALYSIS

OVERVIEW

The major sources of energy used by consumers have changed throughout history as the money price, resource availability, and convenience of use have changed. As the price rises for one source or drops for another, consumers and producers switch to the less expensive alternative. The history of United States energy use demonstrates the flexibility of the economy in using different sources depending upon the opportunity cost involved in the use of each source. As supplies, technology, and demand for energy changed, new sources of energy were made available for the economy.

CONCEPTS Energy, resource (factor of production), scarcity, supply, demand

MATERIALS NEEDED Handouts 8-1 and 8-2

OBJECTIVES Students will

- Name the parts of a graph and its functions;
- Extract information from graphs. This includes information that is shown and that which is not shown.

PROCEDURE

1. Read the following statement to the class: Today's lesson illustrates how to read and interpret economic graphs.
2. Have students read, in class, part A of Handout 8-1.
3. Have students try to interpret Figure 8-1 in the reading by writing one or two sentences summarizing the graphs in the figure.
4. Take a random sample of ten sentences from the class and put them on the chalkboard for comparison.
5. Ask students why there is so much difference among the summary sentences.
   a. Students may say that there was too much information to put into one or two sentences. (If so, tell students that is why we use graphs; they summarize a lot of facts.)
   b. Students may not understand how to read graphs.
   c. Students may not agree on facts being presented. If they agree on facts, they may disagree on the interpretation of the facts.
   d. Do the graphs in Figure 8-1 indicate that we are using less of any of the sources? (*No, the graphs show only relative energy used—not absolute use.*)
6. Have students examine Figure 8-1 to answer the following questions:
   a. How has the United States changed its energy use from 1850 to the present?
   b. Why do you think the major U.S. energy users switched from wood to coal to oil and natural gas?
   c. Do the graphs tell us why the users switched? (*No.*)
7. Have students work on part B of Handout 8-1. Have them discuss techniques useful for reading graphs.
8. Have students complete part C and then compare their answers to the questions. Check whether students agree in their answers. (Answers to questions 1 through 3 should be the same for all students—see answer sheet. Questions 4 and 5 require students to make inferences about the information in the graph. Question 6 cannot be answered from information on the graphs. Students need to learn they should not overgeneralize.)
9. *Optional:* Distribute Handout 8-2, "Drawing Inferences from the Graphs in Figure 8-2."

SOURCE: This lesson is from *Energy Tradeoffs in the Marketplace.* (Washington State Council on Economic Education and Office of the Superintendent of Public Instruction for the state of Washington, 1980). The activity was prepared by Kenneth E. Leonard.

ANSWERS TO QUESTIONS IN PART C OF HANDOUT 8-1

1. A good title will tell you what information you should find on a graph. What information do you expect to find in the graphs? *(Energy use per employed person in U.S., GNP per employed person in U.S.)*
2. What are the titles on the vertical axis of the graphs? *(Barrels of Energy; Dollars of GNP (1970))*
3. What is the title on the horizontal axis of the graphs? *(Years)*
4. What is included in the category Barrels of Energy? *(Amount of energy used that comes from all sources and forms of energy (electricity, natural gas, nuclear power, coal, hydroelectric, solar, petroleum). All these categories have to be put into a common measurement and added together. Then the total is divided by the number of people employed in the U.S. to get an average number of barrels used per person employed for every year.)*
5. What is included in the category Dollars of GNP (1970)? *(This is the dollar value of all final products and services sold in the U.S. in one year (GNP), divided by the number of people employed in the U.S. Gross National Product includes cars, toys, soft drinks, services, and everything else we pay for and consume.)*
6. The lines plotted in the two graphs indicate how much energy was used and how much GNP was produced by each employed person in the U.S. How much energy was used in 1955, in 1957, in 1972, and in 1975? *(Cannot be answered from these data.)*

Instructional Activity 9

GEOLOGIST'S DILEMMA
Simulation/Discussion

OVERVIEW

The total amount of energy resources in existence is unknown but the economic supply of energy resources is limited. The available supply of energy is what producers are willing and able to offer for sale. Notice this is different from the amount of energy resources distributed in the world. Suppliers will respond with an increased willingness to provide energy as the price received for the energy rises.

Environmental damage will take place as producers search for energy, unless the cost of environmental damage is made part of their anticipated costs of production. But requiring energy producers to avoid or repair environmental damage will increase the cost of producing energy.

Consumers increase their demand for energy because the purchase provides better benefits than alternative purchases.

In a market setting an increase in demand for a commodity coupled with a decrease in supply (other things remaining equal) will lead to higher prices.

CONCEPTS Scarcity; opportunity cost; resources; interdependence; incentive

OBJECTIVES Students will

1. Observe that the actual remaining fossil fuel reserves are unknown.
2. Predict that as fossil fuels become more difficult to find and retrieve, the cost of energy will increase.
3. Infer that the price of energy will influence producers' incentives to explore for new energy deposits.

MATERIALS NEEDED

A large handful of very small beads (number 10 beads), at least four different colors, in a small container. A suggested distribution of bead colors is given in Procedure 3.

Do **NOT** *count the beads—***total resources should remain unknown to all.**

Conduct this activity in an area where a large number of beads will be hidden or lost. If you repeat the activity with other classes in the same area, you need only keep throwing the recovered beads up since the lost beads in the first throw are still there waiting to be found. Keeping the total reserves unknown to all simulates our existing world reserve dilemma.

PROCEDURES

1. Before students arrive in class, throw the handful of beads high into the air, hitting the ceiling.
2. Read the following statement to the class: This lesson illustrates some of the existing dilemmas in obtaining energy supplies.
3. Divide the class into four companies. Each company will search for one color bead. The total number of beads should be broken down into the following proportions.

   Company 1—black (coal) 50%
   Company 2—red (uranium) 3%
   Company 3—white (natural gas) 10%
   Company 4—blue (oil) 37%
4. Explain that you have thrown an unknown quantity of beads—energy resources—on the classroom floor. The distribution represents that estimated to be available in 1957.
5. The first search will last one minute.
6. Start the search. (NOTE: If any company starts to gather all colors, *do not* interfere or comment.)
7. Stop after one minute.

SOURCE: This lesson is from *Energy Tradeoffs In The Marketplace* (Washington State Council on Economic Education and Office of the Superintendent of Public Instruction for the state of Washington, 1980). The activity was prepared by Kenneth E. Leonard.

8. Have each company count its resources (assigned color).
9. Keep the resources (beads) in separate piles. Record the total of assigned colors for each group for each round on the chalkboard.
10. Start a second search for one more minute. Each company must search for resources *still missing*. Record totals.
11. Start a third and final one-minute round. Record totals.
12. *Discussion Questions*
    a. Which energy sources were most readily found? Why? Which were found least easily? Why? What makes them easy or difficult to find? Is it the availability of the beads or is it the skill of the searchers? (NOTE: Be wary of words like "hard" and "easy"—these assume equal abilities and diligence between groups.)
    b. Looking at the piles of energy, what generalizations can you make? *(The third pile collected may be smaller than the previous piles because the beads are harder to find or people may not have looked as diligently.)*
    c. Did anyone collect more than one energy resource? Is it realistic to collect more than one? Explain. *(Yes—it is realistic; companies will gather the most accessible source of energy—i.e., oil companies often pump natural gas—or mine coal.)*
    d. What *economic* resources were used to gather the energy beads? *(Labor plus capital, i.e., pieces of paper, pencils, etc.)*
    e. What do we know about the number of beads that were left on the floor? *(Only that there are fewer beads available now than when the group first started to search for them.)*

       NOTE: Students may state that we are "running out" of beads. You may want to pursue what this does or does not mean. Have we found 5 percent, 50 percent, 95 percent, or some other percent of the total supply? *(No one knows for sure!)*
    f. What is the supply of energy? (**It is not all of the beads thrown on the floor;** *instead it is the beads on the table and whatever additional beads students can find in the near future if they think that they can receive a good price for what they have found so far.)*
    g. How might we have found more beads in the same time period? *(A broom or vacuum cleaner—technological advance—could be used, or everyone could look for all colors.)*
    h. What must you give up (opportunity cost) when obtaining a vacuum cleaner or broom during the search period? *(The opportunity cost is any beads that must be forgone while you are looking for a vacuum cleaner.)*
    i. As energy becomes more scarce and demand continues to increase, what should happen to prices? *(Prices should rise.)* Why? *(Because the supply is not increasing.)*
    j. Did the room's environment undergo change as you searched for beads? *(If the furniture was disturbed or paper was left on the floor, this would represent environmental costs.)*
    k. Ask for student volunteers to help clean up the room. Then ask how many students would help if you paid them a penny a bead. Increase the amount that you offer per bead to 5¢, 10¢, 25¢ per bead until you entice the entire class into helping you. Then relate their response to the law of supply and demand, which indicates that increased price will call out a larger supply.
    l. Have students construct a supply curve based on the information secured from the preceding question.

Instructional Activity 10

ORGANIZATION OF PETROLEUM EXPORTING STUDENTS AND TEACHERS (OPEST)
Simulation/Discussion

CONCEPTS Price; Price Controls; Supply; Surplus; Demand; Shortage; Competition

OBJECTIVES Students will

1. Observe that cartel activity can limit the supply of petroleum, thereby affecting the price and quantity demanded.
2. Be able to explain how price controls affect quantity supplied and price.
3. Be able to predict price and quantity changes resulting from increased competition.

MATERIALS NEEDED

1. Instructions for Playing the OPEST Game (Handout 10-1)
2. Individual Transaction Sheet—Seller (Handout 10-2); enough for half the class
3. Individual Transaction Sheet—Buyer (Handout 10-3); enough for half the class
4. One hundred DOLLAR cards, one hundred PETRO cards, and fifty ALTER cards (Handout 10-4)
5. Sample of Individual Transaction Sheet (Visual 10-1)
6. Class Transaction Sheet (Visual 10-2)—use as transparency or copy on wrapping paper, oaktag, or chalkboard
7. Seller Information Sheet (one copy). Do not distribute to class

PROCEDURES

1. Tell students that they will be participating in a simulation activity (game) called OPEST.
   a. Clear the center of the room to form a marketplace.
   b. Select one student to be keeper of the PETRO, ALTER, and DOLLAR cards.
   c. Select one student to record all market transactions on the Class Transaction Sheet.
   d. Divide the class into two equal groups. One group will be sellers (suppliers); the other group will be buyers (consumers). Sellers remain sellers throughout the simulation and buyers remain buyers.
   e. Now assign about one-third of the sellers to OPEST. The rest will be independents.
   f. Distribute the instructions (Handout 10-1) and the appropriate individual transaction sheet (Handout 10-2 or 10-3) to the buyers and sellers. Have the sellers check OPEST or Independent in the space provided at the top of their sheet.
   g. Project Visual 10-1 (completed transactions sheets for buyers and sellers) to explain how to use the sheet.
2. Read the following material to the class:
   a. Your goal in this simulation is to make decisions that help you gain money in your role as buyer or seller.
   b. *Buyers*: You must have energy to survive. In this simulation, you must acquire *five units of energy in each round* to survive. Each unit of this energy can be either a barrel of petroleum or a unit of ALTER (alternative energy). If you choose not to purchase oil, you must pay for the consumption of ALTER at the price for that round. You are trying to pay the lowest total price possible for your energy consumption each round.
   c. *Sellers*: You are trying to maximize your profits by selling barrels of petroleum. You must decide beforehand how many barrels you will offer for sale during each round. As teacher, I will give you cost-of-production information and some price information before each round. *You must take a loss equal to the amount of the production cost for each barrel you plan to sell but are unable to sell.*
   d. During each round, go to the marketplace, find a seller or buyer, agree on a transaction price, and exchange cards. Mark the transaction price on your Individual Transaction Sheet. It is the seller's responsibility to go to the Class Transaction Sheet and record the deal. Then both the buyer and seller may re-

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This activity was prepared by Kenneth E. Leonard.

turn to the marketplace to make additional transactions.

e. When deciding on transaction prices, increases or decreases in the sale price may occur only in $1.00 increments.

f. Three rounds of trading will be conducted. Each round will last five minutes.

g. Make as many deals as you wish in the time permitted.

h. You will have to figure your net gains or losses after each round is finished.

3. Walk through a sample round with students.

4. *Conduct Round 1*

a. Show Independents the price ceiling for Round 1.

b. Show OPEST members the designated quantity and price for Round 1.

c. Distribute DOLLAR cards (5 each) to buyers and PETRO cards (number specified in the table on the facing page) to sellers.

d. Open the round for buying and selling. Notify students when there is one minute remaining in the round. Call time after five minutes.

e. Buyers who have not purchased five units of oil will turn in DOLLAR cards for ALTER cards and record ALTER price on their Transaction Sheets.

f. Allow students time to figure their individual net gains or losses.

g. *Focus Questions.* Tell class to look at the Class Transaction Sheet. Ask: How many barrels of oil were sold? At what price did most transactions occur?

5. *Conduct Round 2*—Same as Round 1

6. *Conduct Round 3*—Same as Rounds 1 and 2

DISCUSSION QUESTIONS:

1. Ask which students spent the least money as buyers and which students made the most as sellers.

Questions for Sellers:

2. How did you decide what number of barrels of oil to offer for sale in each round? *(Considered price and cost information and then guessed.)*

3. Did you have a net gain or loss of money? What might have helped cause your net gain or loss? *(Fixed price, member of OPEST, or Independent.)*

4. How many barrels of oil would you have offered for sale if there had been a Round 4? Why? *(Probably more for Independents because of anticipated higher prices. Probably less for OPEST because of anticipated competition and increase in quantity supplied by Independents.)*

5. What motivates or prompts suppliers to produce goods and services and offer them for sale? *(The possibility of making a profit/fun of competition/producing the product or service.)*

Questions for Buyers

6. How did you decide whether to buy oil or ALTER? *(Price was the main consideration.)*

7. What happened to the amount of oil sold and the price of oil in Round 3? Why? *(Price should rise as well as quantity sold, because the restraints are removed from Independents.)*

8. What would we expect to happen to price and quantity in a fourth round if there are no constraints on independent sellers? *(May continue trend of Round 3, or stabilize.)*

9. Must buyers in energy markets always buy energy? *(No, they can conserve or go without.)*

SELLER INFORMATION SHEET FOR OPEST GAME

Independent Seller Information

SAMPLE ROUND	Do not transact at more than $12 per barrel.
ROUND 1	Do not transact at more than $12 per barrel.
ROUND 2	Do not transact at more than $17 per barrel.
ROUND 3	Make transactions at any price you wish.

OPEST Seller Information

SAMPLE ROUND	Offer only 3 barrels for sale at a price of $33.
ROUND 1	Offer only 3 barrels for sale at a price of $33 (be patient).
ROUND 2	Offer only 4 barrels for sale at a price of $33 (be patient).
ROUND 3	Offer only 3 barrels for sale at a price of $34 (be patient).

	Number of PETRO Cards to Distribute	
	Independents	OPEST
Sample Round	5	3
Round 1	3	3
Round 2	2	4
Round 3	2	3

Instructional Activity 11

THE ECONOMICS OF CONSERVATION

MATERIALS NEEDED Handout 11-1

OBJECTIVES Students will

- Examine the effects of changes in the price of gasoline on consumer behavior by conducting a survey of automobile owners;
- Apply the concept of opportunity cost to evaluation proposals for dealing with the problem of scarce energy resources.

PROCEDURE

1. Every class member is to survey two car owners about the relationship between price and gasoline usage. Students should ask the following question: "If the price of gasoline were to go up _____ (read the amount) per gallon, would you be likely to use your car as you do now, a little less often, seldom, or not at all?" Repeat the question four times, using 10¢, 50¢, $1.00, and $2.00, and record the responses on a table such as this one below. (Copy the table on the chalkboard.)

	Increases in Price			
Use Your Car:	10¢	50¢	$1.00	$2.00
As much as now.				
A little less often				
Seldom or not at all				

2. Record the survey responses on the chalkboard and then discuss them, using the following questions as a guide:
   a. What was the relationship of gasoline use and price?
   b. What do you suppose would happen if the price of gasoline were to go down?
   c. Using the survey results as a guide, how much would the price of gasoline need to increase to reduce greatly the amount being used?
   d. The price of gasoline has increased substantially over the last few years. How are people coping with the increasing costs of gasoline? *(Buying more efficient cars; driving less; in some cases spending less on other items in their budgets.)*
3. Distribute Handout 11-1. Ask students to rate each proposal as directed on the handout.
4. After students have rated each proposal, discuss their ratings. The following questions can be used to guide the discussion.
   a. Which proposals do you agree with? Disagree? Why?
   b. How practical is each proposal?
   c. How enforceable is each proposal?
   d. What are the opportunity costs of each proposal?
   e. Which energy uses are necessities? Which are luxuries?
   f. Do we need to accept more pollution as we meet our energy needs?
   g. Is it better to use the price system or government regulation to allocate scarce energy resources?

This activity was prepared by Ronald A. Banaszak and Elmer U. Clawson. It is based on a lesson in *Our Economy: How It Works*, by Clawson (Reading, Mass.: Addison-Wesley Publishing Company, 1980). Used with permission.

III. A READING FOR ADVANCED STUDENTS

ANALYZING ENERGY POLICY OPTIONS FOR OIL

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Over the past few years there has been much debate in government and among the public over the proper course energy policy should take. Despite the apparent complexity of the world energy situation, one can use relatively simple supply/demand analysis to show how various energy policies will impact energy markets.

The purpose of this note is to show how supply/demand analysis can be used to evaluate the impact of selected energy policy options on the market for oil. Policy options that will be analyzed are:

1. The unregulated oil market
2. A ban on all oil imports
3. Oil import quotas
4. A tax on oil imports
5. A tax on all oil supplied
6. A tax on all oil consumed
7. Price controls on all oil
8. Price controls on domestic oil

Policy Option One— The unregulated oil market

Figure 1 depicts the oil market for a major oil-producing and consuming nation like Canada or the United States. The line labeled $S_{Domestic}$ shows the various quantities of domestically produced oil that will be made available at various possible prices. The horizontal line labeled S_{OPEC} shows that the supply of imported oil to the importing country is perfectly elastic at the official OPEC price. Under an unregulated energy market it will only be profitable for domestic oil producers to supply Q_D of oil since

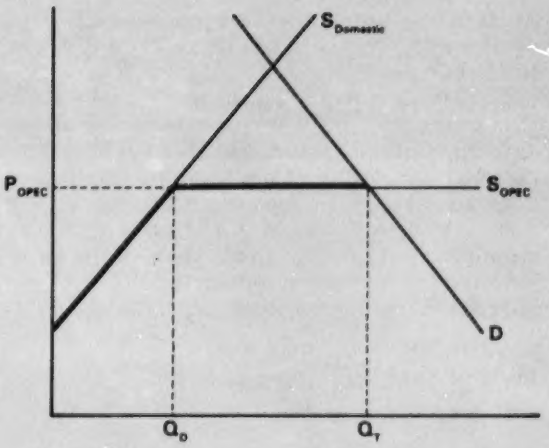

Figure 1

beyond Q_D OPEC oil can be imported at less cost than additional domestic supplies can be made available. OPEC is the marginal supplier and its price determines the domestic price of oil. At a price of P_{OPEC} Q_T of oil is demanded. The difference between Q_T and Q_D represents the amount of oil imported.

Policy Option Two— Banning all oil imports

If all oil imports are banned, the price of oil will rise until all excess demand for oil is eliminated. This will occur at price P_h with Q_h of oil being sold (Figure 2). The higher price will discourage domestic consumption in the amount $Q_T - Q_h$ and encourage additional production in the amount $Q_h - Q_D$. There will be

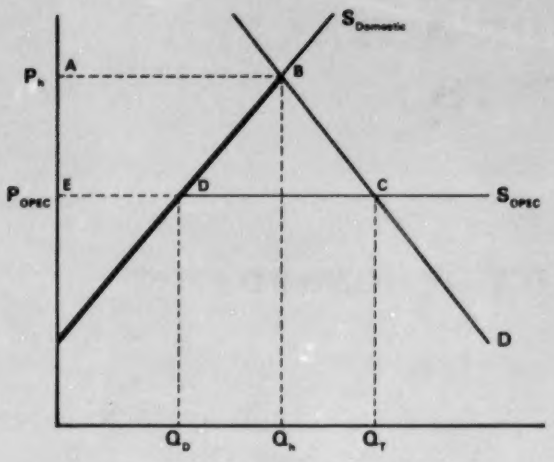

Figure 2

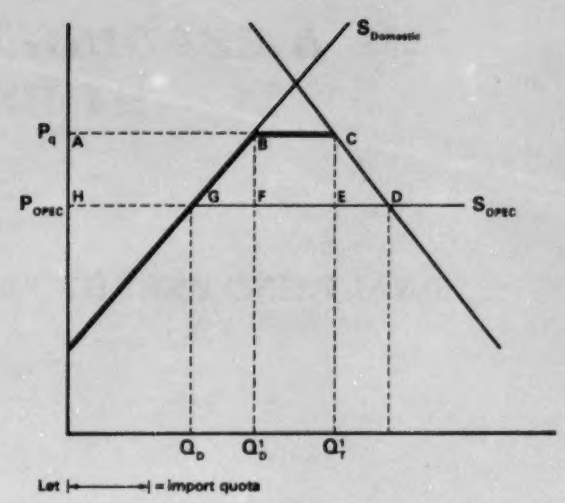

Figure 3

a loss of consumer surplus equal to ABCE. Producers will gain ABDE of this loss and the area BCD represents the net economic loss to society. Thus, a policy banning all oil imports eliminates the political vulnerability of an oil embargo but it does it at a fairly high cost. The policy also encourages more rapid exploitation of existing domestic reserves. This may create greater political vulnerability in the future as supplies run low; it could also hasten the transition to other energy alternatives, thereby lessening the economy's overall dependency on oil.

Policy Option Three— Oil import quotas

Suppose the government decides instead on an oil import quota under which a lesser amount of foreign oil will be imported than would be imported under unregulated market conditions. Figure 3 illustrates this situation. In such a case the market price of oil will rise until all excess demand is eliminated. This will occur at price P_q. The results of this policy will be to reduce oil imports from $Q_T - Q_D$ to $Q'_T - Q'_D$. Domestic production will increase from Q_D to Q'_D and overall oil consumption will decrease from Q_T to Q'_T. The right to import oil under a quota system has a positive economic value of $P_q - P_{OPEC}$ since oil that can be purchased on the world market at P_{OPEC} can immediately be resold in the domestic market for P_q. If oil import quotas are assigned by the government to oil importers, the oil importers pocket this gain (equal to BCEF on Figure 3). If instead the government auctions off the right to import oil, the gain will accrue to the government. In either case this gain comes at the expense of the consumer who has a loss of consumer surplus of ACDH as a result of import quotas. Producers gain ABGH in producer's surplus leaving an overall economic loss to society from the import quota of area BFG plus area CDE. Other policy implications of an import quota run in the same direction as a ban on oil imports although the magnitude of the effect will be less.

Policy Option Four— A per barrel excise tax on oil imports

A per barrel excise tax on oil imports raises the price of all oil sold by the amount of the tax and raises the price of imported oil relative to

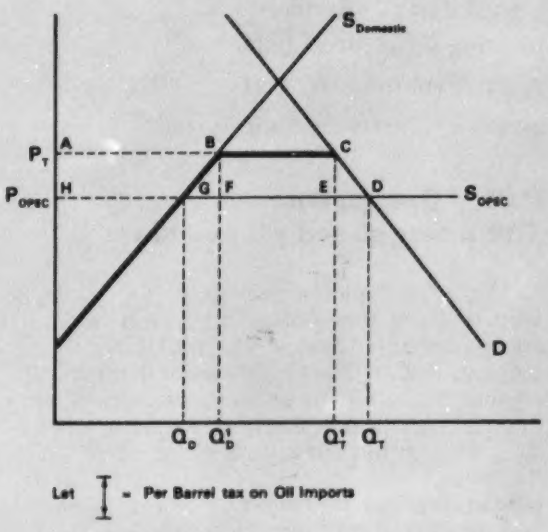

Figure 4

domestic oil. This results in an increase in domestic production at the same time as there is a decrease in imports and overall oil consumption. Figure 4 illustrates this situation for the case of a per barrel tax equivalent to $P_T - P_{OPEC}$. The results and policy implications are virtually identical to those for oil import quotas shown above, except that in the case of a tax the gain BCEF unambiguously goes to the government.

Policy Option Five— A per barrel excise tax on all oil supplied

A per barrel excise tax on all oil supplied will shift both the domestic and foreign supply curves up by the amount of the tax. Consider a per barrel tax in the amount of $P_T - P_{OPEC}$ as illustrated in Figure 5. The conservationist in-

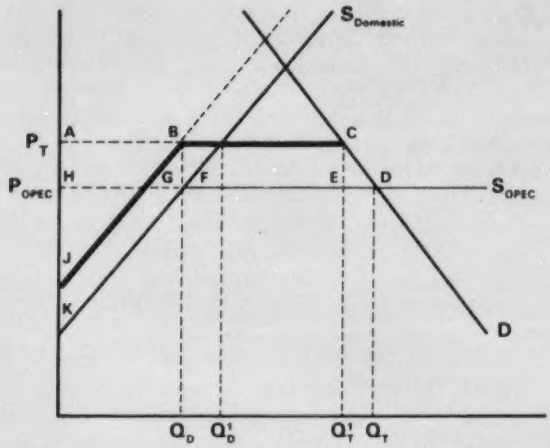

Figure 5

fluence of such a tax will be the same as under Option Four in that total oil consumption drops from Q_T to Q'_T. The major difference, however, is that under Option Five domestic production is not stimulated and hence the reduction in overall oil imports is not as great as under Option Four (imports are $Q'_T - Q_D$ rather than $Q'_T - Q'_D$). Under Option Five there is no gain or loss in domestic producer surplus since the old producer surplus HFK exactly equals the new producer surplus ABJ. Under Option Five the government in effect has appropriated the producer surplus created by its policy action. This is a major difference from Option Four. Lost consumer surplus is equal to ACDH of which all but area CDE is recovered by the government in the form of additional tax revenue.

Policy Option Six— A per barrel excise tax on oil consumption

A per barrel tax on oil consumption will have the effect of shifting the demand curve for oil down by the amount of the tax. Consider a tax in the amount of $P_{OPEC} - P_T$ in Figure 6.

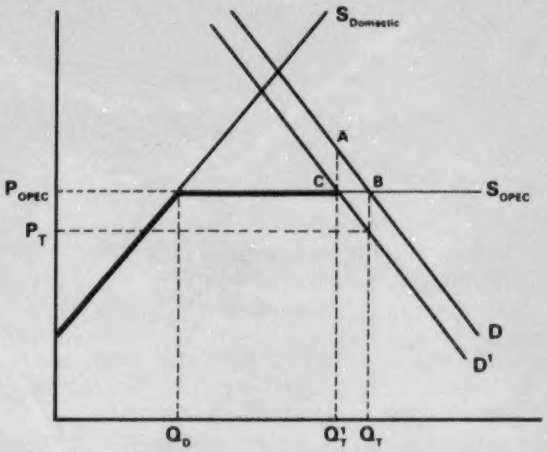

Figure 6

This causes the demand curve to shift from D to D^1. The result is a decline in total oil consumption of $Q_T - Q'_T$, all of which translates into a reduction in oil imports. There is no impact on price. The loss of consumer surplus not recovered by government in the form of tax collections is equal to area ABC. To the extent that other nonprice energy conservationist policies are effective, they will have the same direction of effect as an oil consumption tax. Thus the impact on the oil market of policies such as reduced highway speed limits, mileage standards for autos, mandatory thermostat setbacks, laws prohibiting oil-fired boilers, etc., can be analyzed using Figure 6.

Policy Option Seven— Price controls on all oil

If the government were to impose price controls on all oil at a price below the world price (P_{OPEC}) then energy markets would not clear. Since the price at which oil could be sold for on the domestic market would be less than its cost to buy on the world market, no oil would be imported. Figure 7 illustrates this result. At the controlled price P_C, Q'_T of oil is demanded while only Q'_D of oil is supplied. The result is a serious energy shortage in the amount of Q'_T

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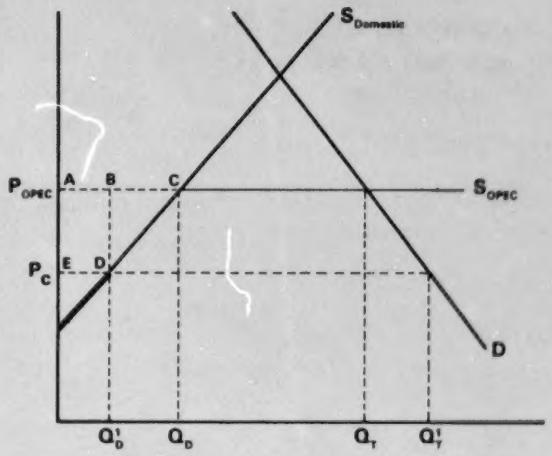


Figure 7

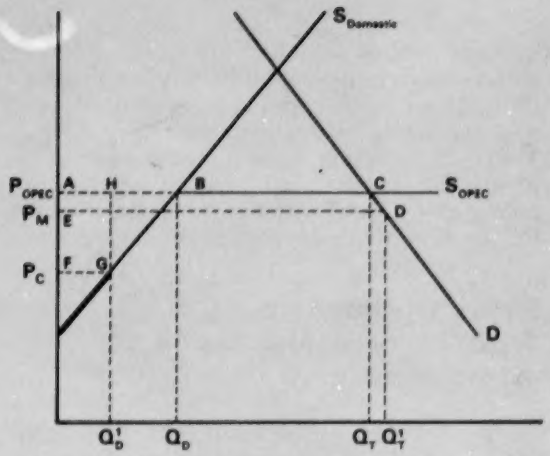


Figure 8

– Q^1_D. Consumers are protected from the direct financial impact of high world oil prices but bear the indirect impact of shortages as they find they are unable to purchase all they would like at the controlled price. The result is rationing via lines at service stations or through a more structured mechanism by the government. Compared with an unregulated market there is a loss of consumer surplus for what oil consumers would have bought but can't, due to the shortage (the area under the demand curve to the right of Q^1_D and above P_{OPEC}) and there is a gain in consumer surplus equal to ABDE. Whether the gain offsets the loss is an empirical question. The important point to note, however, is that even in the short run, one can't say consumers unambiguously gain from price controls. Domestic producers lose ACDE of producer's surplus. The overall welfare loss to society from the price controls is equal to the area between the $S_{Domestic}$ (to Q_D)/S_{OPEC} (beyond Q_D) supply curve and the demand curve to the right of Q^1_D.

Policy Option Eight— Price controls on domestically produced oil

If price controls are placed on all domestically produced crude but not on imported oil, the resulting market price faced by consumers will be a melded price somewhere between the controlled domestic price and the uncontrolled world price. In Figure 8 P_C represents the price control on all domestic oil and P_M represents the melded market price faced by consumers. Under this policy Q^1_D will be supplied domestically and Q^1_T will be demanded. The difference between Q^1_T and Q^1_D represents imports. Thus a policy of controlled prices on domestically produced oil discourages domestic production and encourages domestic consumption resulting in higher import levels than would occur in an unregulated market. There is a gain in consumer surplus of ACDE and a loss in domestic producer surplus of ABGF. If the policy were modified so that only "old" oil was controlled but "new" oil could be sold at uncontrolled prices, then the quantity $Q_D - Q^1_D$ would represent "new" oil supplied, and oil imports would be reduced accordingly. Oil imports and overall energy consumption would still exceed that in an unregulated market by the distance $Q^1_T - Q_T$. Domestic producer's surplus would only be reduced by AHGF in this case and the gain in consumer surplus would continue to be ACDE.

Evaluating The Options

Having looked at the relative impact of various energy policy options for oil, the question remains: Which is best? This is a subjective question to which the economist must answer: Best for what? On the one hand, if the objective of the policy is to cut dependence on unreliable sources of foreign oil, then the policy of banning all oil imports makes the most sense. If, on the other hand, the goal is to raise tax revenue or to protect consumers from rising prices, then such a policy is entirely inappropriate.

The desirability of an energy policy depends on the weighting one gives to the different possible criteria. In many cases a policy that satisfies one or more desirable criteria fails to satisfy other equally desirable criteria. The choices that must be made in setting an energy policy, as in setting other of economics policies, are not always easy ones to make since they almost inevitably involve trade-offs. The value of economics is in helping us to understand what those trade-offs are so that more rational decisions can be made.

IV. PRE- AND POST-TESTS FOR JUNIOR AND SENIOR HIGH SCHOOL

MARIANNE B. TALAFUSE
Center for Economic Education, Ball State University

Answer Keys

Quest. No.	Junior High		Senior High	
	Pretest	Post-test	Pretest	Post-test
1	b	c	d	a
2	a	d	d	c
3	d	c	c	c
4	c	d	a	b
5	d	a	a	c
6	b	b	d	d
7	c	d	a	b
8	a	b	a	d
9	d	b	b	b
10	b	a	a	c

JUNIOR HIGH SCHOOL PRETEST

1. The division and specialization of labor usually result in:

   a. Increased unemployment.
   b. More efficient production of goods and services.
   c. Less trade among nations.
   d. Nations becoming more independent.

2. The demand for coal refers to how much coal:

   a. People are willing and able to buy at each price.
   b. Producers decide to mine.
   c. Firms have for sale.
   d. People would like to buy.

3. Which of the following best describes "factors of production"?

   a. Land, water, air.
   b. Engineers, chemists, and pilots.
   c. Solar, nuclear, and fossil-fuels energy.
   d. Land, labor, and capital.

4. What is the potential reward to those who take the investment risks in energy production?

   a. Salaries.
   b. Interest.
   c. Profits.
   d. Rents.

5. Throughout most of the nineteenth century, which of the following was the predominant energy source in the United States?

   a. Natural gas.
   b. Oil.
   c. Wood.
   d. Coal.

6. Which of the following terms is commonly used to indicate the money value of all goods and services produced by the economy in a year?

   a. The Consumer Price Index.
   b. Gross national product.
   c. The volume of stocktaking.
   d. The Wholesale Price Index.

7. The opportunity cost of producing energy is:

   a. The increasing costs of producing energy.
   b. The costs of research and development.
   c. Other things that could be produced instead.
   d. The costs of energy conservation.

8. The scarcity of energy is an economic problem:

   a. Even for well-to-do families in the United States.
   b. Only for poor families in the United States.
   c. For individuals and families, but not for government or nations.
   d. Only for people who live in underdeveloped countries.

9. The best measure of economic growth in a country is the year-to-year change in:

   a. The amount of money in circulation.
   b. The number of energy-efficient vehicles produced.
   c. The size of the national debt.
   d. The amount of goods and services produced.

10. How much an oilfield worker earns depends mostly on:

   a. Whether or not the worker belongs to a union.
   b. The supply of and demand for the workers' skills.
   c. What has been paid in the past.
   d. The kind of firm employing the worker.

JUNIOR HIGH SCHOOL POST-TEST

1. All societies must determine:

   a. Why energy resources are used.
   b. Why people conserve energy.
   c. How to use energy resources most efficiently.
   d. How to encourage the conservation of energy.

2. When resources are used to drill an oil well, the opportunity cost is:

   a. The amount of money spent.
   b. The length of time involved.
   c. The drilling rights that must be obtained.
   d. The things that could have been produced with the same resources.

3. Land, labor, and capital are used to produce:

   a. All goods.
   b. All services.
   c. All goods and services.
   d. Most goods and services.

4. Specialization increases output because:

   a. Jobs are more interesting.
   b. Jobs are more available.
   c. Workers work harder.
   d. Workers work at what they do best.

5. Firms take risks to produce energy because they hope to earn:

   a. Profits.
   b. Public approval.
   c. Government contracts.
   d. Better credit ratings.

6. The demand for electricity depends on:

   a. How many utility companies there are.
   b. How much people are able and willing to buy at various prices.
   c. How far consumers are from production sites.
   d. How many people need electricity.

7. The supply of electricity depends on:

   a. How much people say they need.
   b. How much is wasted.
   c. How much government allows to be produced.
   d. How much producers are able and willing to produce at various prices.

8. The most likely effect of a large tax increase on gasoline at the pump will be to:

   a. Encourage gasoline sales.
   b. Discourage gasoline sales.
   c. Discourage the conservation of gasoline.
   d. Have no effect on either sales or conservation.

9. Conservation of energy resources benefits:

   a. Individuals only.
   b. Society as a whole.
   c. Producers of energy.
   d. Government planners.

10. A national energy plan would have to make trade-offs between the goals of:

   a. Equity and efficiency.
   b. Equity and justice.
   c. Stability and efficiency.
   d. Stability and justice.

SENIOR HIGH SCHOOL PRETEST

1. All economic systems must make choices regarding:

   a. Ways to reduce government spending.
   b. How to increase energy spending.
   c. The conservation of energy.
   d. The best use of scarce resources.

2. When resources are used to construct an offshore drilling rig rather than a pipeline, the pipeline represents:

   a. Diminishing marginal returns.
   b. Specialization of labor.
   c. A consumer good.
   d. The opportunity costs of the drilling rig.

3. An example of capital used in the production of solar energy is:

   a. Money.
   b. Engineers.
   c. Solar collectors.
   d. Building sites.

4. Specialization in the production of energy followed by increasing international trade probably would:

   a. Increase total world production of energy.
   b. Eliminate differences in standards of living among nations.
   c. Increase the likelihood of worldwide unemployment.
   d. Lower living standards in the wealthy nations.

5. "Economic demand" for coal refers to how much coal:

   a. People are willing and able to buy at each price.
   b. People want whether they can buy it or not.
   c. Government orders to be produced.
   d. Is available for sale.

6. On the surface, it appears that the United States and Canada are less energy-efficient than other industrial countries. Which of the following answers best explains why the United States and Canada have higher energy costs?

   a. Countries covering a large area must spend more in energy costs to transport goods and people.
   b. Countries having a scattered population require a greater use of automobiles and, therefore, a greater use of energy.
   c. Countries having very cold winters and/or very warm summers create greater energy costs for heating and cooling.
   d. All of the above.

7. Initially, the price system in a market economy reacts to a shortage of gasoline by:

   a. Raising the price and producer profits.
   b. Decreasing the price and producer profits.
   c. Raising the price and decreasing producer profits.
   d. Lowering the price and increasing producer profits.

8. A rise in the price of which product would be likely to increase the demand for wood?

   a. Coal.
   b. Wood stoves.
   c. Fireplace inserts.
   d. Fireplace equipment.

9. Oil production in the United States peaked in 1970 and then went into a decline. What was the reason for this decline?

   a. Technology to produce oil could not keep up with the demand for oil.
   b. It did not pay oil producers to keep up production since cheaper sources were available.
   c. The price of oil was so expensive that people could not afford it; so they demanded less.
   d. None of the above.

10. A national program of free insulation to conserve energy for the aged poor is proposed. The program would be paid for by an increase in the income tax. These actions promote one economic goal, but work against another. Specifically, these actions are likely to:

    a. Reduce freedom but promote equity.
    b. Reduce equity but promote efficiency.
    c. Reduce stability but promote growth.
    d. Reduce security but promote efficiency.

SENIOR HIGH SCHOOL POST-TEST

1. The economic meaning of the scarcity of energy is that:

   a. There are not enough energy resources to satisfy society's wants for energy.
   b. There is little energy available.
   c. People use more energy than in the past.
   d. A worldwide depression may result from high energy costs.

2. The opportunity cost of a new plant to generate electricity is:

   a. The cost of the new power plant.
   b. The change in the cost of electricity.
   c. The next most desirable economic good that must be given up to build the plant.
   d. The cost of constructing a plant now rather than in the future.

3. The group of three elements that best illustrates the factors of productions—land, labor, and capital goods—is:

   a. Profit, clerks, and trucks.
   b. Oil, teachers, and money.
   c. Coal, clerks, and tractors.
   d. Builders, investors, and manufacturers.

4. The purpose of profits in the production of energy is to

   a. Encourage business to act in a socially responsible manner.
   b. Persuade businesses to produce what consumers demand.
   c. Provide funds to pay workers better wages.
   d. Redistribute income from the poor to the rich.

5. According to the "law of supply and demand," if twice as many barrels of oil were produced this year than previously because a better way was found to use existing drilling machinery:

   a. The supply of oil would stay the same this year.
   b. The demand for oil would go down this year.
   c. The price of oil would go down this year.
   d. The price of oil would go up this year.

6. In a market economy, if the supply of gasoline increases at the same time that the demand for it falls, the price of gasoline:

   a. May either rise or fall.
   b. Will stay the same.
   c. Will rise.
   d. Will fall.

7. If price controls on natural gas are eliminated at a time when prices are set lower than the costs of production, which of the following is most likely to occur:

   a. A decrease in the price of natural gas and a decrease in the supply of natural gas.
   b. An increase in the price of natural gas, perhaps followed later by an increase in the supply of natural gas.
   c. An increase in the demand for natural gas, followed by a decrease in the supply of natural gas.
   d. No change in the price of natural gas, since price controls are usually set where supply and demand intersect.

8. A national system to provide free heating fuel for the aged poor is proposed. The system would be paid for by an increase in the income tax. These actions promote one economic goal, but work against another. Specifically, these actions are likely to:

   a. Reduce security but promote efficiency.
   b. Reduce equity but promote efficiency.
   c. Reduce stability but promote growth.
   d. Reduce freedom but promote equity.

9. In comparing the United States and Canada to other Western industrial nations in terms of energy use, one would find that:

   a. The United States and Canada use much less energy per unit of GNP than the other nations.
   b. The United States and Canada use more energy per unit of GNP; however, this is not due to their being less efficient, but rather to a mix of economic conditions.
   c. The United States and Canada use more energy per unit of GNP; this condition is a direct result of less efficient uses of energy.
   d. There is no significant difference between the United States, Canada and the other nations in terms of their energy use.

10. Which statement is *not* true of electricity?

   a. It enables goods to be produced further from a power source.
   b. It uses more energy to produce than it makes available.
   c. It raises the cost of goods more than other types of energy.
   d. It allows goods to be produced at a lower cost.

V. An Annotated Catalog of Materials for Teachers

JERRY R. MOORE, JAMES L. ALOUF, AND JOSEPH O'BRIAN
Center for Economic Education, University of Virginia

In our review of economics of energy materials, we found extensive bibliographies and references, but they were often so inclusive as to be meaningless for our purpose. The criterion for selections in this catalog is their usefulness to the classroom teacher interested in presenting the economics of energy.

The references included in this document were collected from the following sources:

- government agencies
- energy producers and associations
- consumer interest groups
- educational associations and publishers
- civic groups

This guide is organized into the following sections:

- Curriculum Guidelines
- Background Resources for Teachers
- Background Resources for Students
- Teaching Units and Activities

This organization seemed more productive than traditional divisions based upon the media form of the materials. Materials with an asterisk (*) preceding it are recommended. Prices of the materials may be secured by writing the sponsoring organizations.

CURRICULUM GUIDELINES

Preparation to teach the economics of energy should begin with:

Master Curriculum Guide in Economics for the Nation's Schools Part 1, *A Framework for Teaching Economics: Basic Concepts.* New York: Joint Council on Economic Education, 1977. A revised edition is planned for 1983-84.

The Master Curriculum Guide is must reading for the classroom teacher designing economics units. Most of the publication is devoted to the presentation of the content and method framework of economics; economic concepts and economic analysis are delineated in highly readable terms. Section IX is devoted to the application of basic economic elements to the case of scarce oil—an excellent model for the development of economics of energy units for the classroom.

Secondly, the teacher or school interested in economics of energy would do well to subscribe to:

**Energy and Education*, National Science Teachers Association, 1742 Connecticut Avenue, Northwest, Washington, DC 20009

Energy and Education is a newsletter published five times a year as part of the Energy-Enriched Curriculum Project of the National Science Teachers

Association (NSTA). The newsletter keeps social studies and science teachers abreast of new materials on energy-related topics, organizations providing resource assistance for energy programs, and special meetings for educators interested in energy topics. Articles providing new data on economics of energy issues are frequently included.

Political support for the classroom teacher interested in initiating curriculum change to include the economics of energy units can be found in:

Paul C. Bauman and Edith M. Petrock, *Energy Education: Why, What and How?* Education Improvement Center, Education Commission of the States, 1860 Lincoln Street, Suite 300, Denver, Colorado 80295.

This brief pamphlet provides basic arguments for the development and inclusion of economics of energy units in public school classrooms. The authors suggest major concepts to include in an energy-based curriculum; major concerns for the objectivity of instructional materials; and constructive suggestions for curriculum planning.

Recently the Department of Energy has completed a work that provides invaluable aid in the preparation of curriculum guides and materials:

**A Conceptual Framework for Energy Education, K-12.* National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161.

This publication was designed to give assistance to curriculum specialists, textbook authors, and producers of energy materials. The contents include the goals of energy education, concept outlines on energy including economic concepts, correlations between energy concepts and social studies and science textbooks, and bibliographic references.

Finally, a brief but well-targeted document for curriculum planning is:

*Rodney F. Allen (et al.), "Guidelines for Energy Education in Social Studies," *Social Education*, v. 45 (December 1981) pp. 558-61.

These guidelines were prepared by a special committee of the National Council for the Social Studies (NCSS). Modeled after the widely circulated *NCSS Curriculum Guidelines*, this short document provides ideas for the development of an energy curriculum (including economic concepts) and suggestions for the assessment of such a curriculum. Because this material has the support of the NSTA and the NCSS, it can be extremely valuable in building support in your school for the study of the economics of energy.

BACKGROUND RESOURCES FOR TEACHERS

Much has been written about energy. A catalog of current resources for the teacher could extend to many volumes. We have been purposefully selective, including materials that are targeted to major issues and that can be read fairly quickly.

The following publication provides statistical information about all energy sources, includes both domestic and international references, and is illustrated with numerous charts and graphs:

Annual Report to Congress: Energy Statistics. Energy Information Administration, U.S. Department of Energy, Washington, D.C. 20585.

For general reading on this subject consider:

Energy Options. League of Women Voters of the United States, 1730 M Street, Northwest, Washington, DC 20036

A short paperback publication serving as a basic reader resource for American citizenry. Teachers will find the energy resource data brief, clearly presented and valuable. The concluding sections of the publication pose significant questions about the American economic system as the country struggles with the energy issue. Some of the material can be used directly by high school students.

Another respected source of information about oil and gas resources and production is the *Exxon Background Series*. The series is intended for adults, but many secondary school students would find the materials useful for research. The materials are available upon request from the:

Public Affairs Department, Exxon Corporation, 1251 Avenue of the Americas, New York, NY 10022

Current titles are:

**Fate and Effects of Oil in the Sea* (1978)

A short publication highlighting the environmental effects of oil spillage and seepage into the oceans. Provides excellent perspectives on the environmental costs of oil production and distribution.

**Tankers and the Flags They Fly* (1979)

A description of the oil-tanker fleets around the world and the people they serve. Raises questions about the effects of taxation on the registration and standards of shipping. Indicates why the oil-consuming nations have come to rely upon "flags of convenience" in the transportation of oil.

**The Offshore Search for Oil and Gas* (1980)

Senior high students and advanced middle school students would find the graphics particularly useful in doing research on drilling rigs. The narrative would be useful in developing an understanding of production costs from the identification of reserves and exploratory drilling to pumping oil from offshore rigs.

**Middle East Oil* (1980)

Excellent data and graphics on production levels, prices, and price changes in recent years, the geography of oil reserves, and the effects of OPEC. The teacher would find the data easy to reproduce and readily useful.

**World Oil Inventories* (1981)

Oil stocks, stock pulldowns, storage structures and flows are described in a clear picture of world oil supplies. These may be the most easily understood data about the impact of price and changing demand upon world supply.

**How Much Oil and Gas* (1982)

An excellent discussion of the methods used to estimate oil and gas reserves and the distribution of proven and estimated oil and gas reserves. Important data for the classroom.

A useful publication on natural gas is:

Ernest Oppenheimer, *Natural Gas: The New Energy Leader*. Pen & Podium, Inc., 40 Central Park South, New York, NY 10019

The material in this book is informative and offers a basis for thoughtful reflection about methane as a source of energy. Students in courses con-

cerned with energy issues and others interested in natural gas as an energy source should consider this readable, gas-industry-focused text.

Single copies of the following materials, funded by local gas utility companies, are available free of charge by writing to Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209.

Natural Gas Energy Kit (1983)

A teaching kit for use in presenting a unit on natural gas in middle through high school. Discusses exploration, production, transmission, distribution, storage, household and commercial uses, and by-products of natural gas.

Natural Gas Energy: A Resource Guide (1983)

A 28-page booklet with color illustrations, telling the story of natural gas—where it comes from, how it got there, and how much there is. Discusses exploration, production, transmission, distribution, storage, household and commercial uses, and by-products of natural gas. Middle–high school. (This booklet is included in the *Natural Gas Energy Kit.*)

America's Changing Energy Story (1980). Filmstrip.

A broad overview of the energy picture in the United States today. It covers current uses of energy (as well as historical trends and future needs) and differences among various forms of energy in efficiency, convenience, and environmental impact. With cassette and teacher's guide. High school.

Natural Gas Teaching Aids Booklet (1983–84)

A complete list of all A.G.A. educational materials.

Energy Reports—A series of reports on various aspects of energy and the natural gas industry. Prepared for grades 7–12. Current titles are:

Coal Gasification
A discussion of the general process of coal gasification, including an estimate of the supplemental gas that may become available.

Drilling Offshore for Natural Gas
Concerns extraction from those areas of the outer continental shelf of the United States where drilling has taken place and the potential has yet to be proved.

Energy Conservation/Efficiency
Considers many routine individual decisions made in obtaining the basic essentials of food, shelter, clothing, and transportation that affect energy conservation.

An Ever-Changing Energy Mix
A discussion of the energy relationships that exist among energy users and energy sources of our society.

Fuels from Biomass
Discusses the potential of biomass as an energy resource. Photosynthesis offers a means of using solar energy to produce a renewable source of methane gas.

Liquefied Natural Gas
A discussion of the growing world commerce in liquefied natural gas (LNG): what it means to the U.S. shipbuilding industry, to the natural gas utility companies, and to the users.

Natural Gas Energy and the Environment
A discussion of the environmental effects of burning fossil fuels, how fossil fuels can be used in ways that are less polluting, and how remaining supplies of fossil fuels can be estimated.

Natural Gas from Nonconventional Sources

Explores four potential sources of natural gas that are not included in most reserve figures: coalbeds, shales, tight sands, and methanated brines.

Synthetic Natural Gas from Peat

Discusses the potential of peat gasification as a practical use for the vast reserves of peat that exist in the United States and have not as yet found a place in our "energy mix."

The following materials are available from the Policy Evaluation and Analysis Group of the American Gas Association:

The Gas Energy Demand Outlook: 1981–2000

A.G.A.'s Gas Demand Committee completed a major series of special studies culminating in an overall U.S. gas demand forecast. Each of the traditional gas markets as well as new nontraditional markets such as cogeneration, natural gas vehicles, and select gas use with coal were examined. The demand study concludes that under the right conditions, the demand for gas energy in the United States can rise up to 50 percent from present sales levels of 20.5 thousands of cubic feet in 1981. Specifically, potentially increased gas use could be forthcoming in commercial buildings, in industrial applications, and in the new markets.

The Gas Energy Supply Outlook: 1980–2000—1982 Update

The A.G.A. Gas Supply Committee updated its widely distributed supply outlook book, the most comprehensive forecast of its kind undertaken to date. This book contains an estimate of long-range potential supplies from conventional and supplemental sources. Elements of the Geological Survey and Department of Energy projections of gas supply and resources, as well as the updated economic and capital efficiency of each of the supplemental supply sources are included.

An excellent economics of energy publication is:

**Electricity: Today's Technologies, Tomorrow's Alternatives.* Electric Power Research Institute, Inc., Communications Division, P.O. Box 10412, Palo Alto, California 94303

Topics covered include energy supply and demand, present and future generating options for electricity, environmental concerns and energy fuels. The material is written for adults, but is within the grasp of most secondary school students. The visuals are extremely useful for a social studies or science classroom.

A more technical publication by the Electric Power Research Institute is:

Overview and Strategy 1981–1985

This study explores economic and energy relationships; future electricity supply; regional differences in energy demand; electricity generation and load pricing; economic and social factors in electricity production, and major environmental issues. The technical content is useful only to the teacher seeking background data.

Other publications complementing the EPRI material are:

**Energy in America: Progress and Potential.* The American Petroleum Institute, Education Programs & Services, 2101 L Street N.W., Washington, DC 20037

In 1980, the American Petroleum Institute published *Two Energy Futures: A National Choice for the 80's*, outlining energy prospects and what the

United States could do to become more energy self-sufficient. *Energy in America: Progress and Potential* provides an assessment of energy fuels supply, conservation, and an analysis of the international prospects in oil production. A well-illustrated, colorful publication with current data and graphics. The API has a number of other educational publications available.

Alexander Taffel, *In Search of Energy*. National Energy Foundation, 366 Madison Avenue, New York, NY 10017

The purpose of this book is to help establish an energy awareness and a basic knowledge of the elements of the energy problem and the possible avenues for its solution in students in the junior and senior high schools. The book can serve as a text or a reference by students as well as teachers. Its illustrations serve to summarize and dramatize important points and concepts. Its content can form an organized energy course or it can serve as the basis for selected lessons in science and social studies classes.

A general discussion of the economics of energy is contained in:

Energy: The Next Twenty Years. Ballinger Publishing Company, Cambridge, Massachusetts (1979)

The Ford Foundation commissioned a Study Group on Energy, which Resources for the Future organized. This short volume, the first chapter of its extensive report, guides the reader through a discussion of energy supply and demand, the market mechanism in the allocation of scarce resources, international implications of energy source locations and energy demand, and externalities in the production of fuels. Advanced reading but most useful.

Joel Darmstadter, Hans H. Landsberg, and Herbert C. Morton, with Michael J. Coda, *Energy Today and Tomorrow; Living with Uncertainty*. Englewood Cliffs, N.J.: Prentice-Hall, 1983.

A publication of Resources for the Future. Reviews uses of energy. Takes up conventional and nonconventional energy sources, energy research and development programs and prospects, economics of energy, environmental issues associated with energy use, and the energy outlook. Includes an extensive glossary, energy conversion tables, and suggestions for further reading.

Resources. Resources for the Future, Inc., 1755 Massachusetts Avenue, Northwest, Washington, DC 20036

Resources publishes selected monographs on the supply of important resources and protection and improvement of the environment. Frequently the studies focus on current topics and issues in economics of energy. *Resources* also includes reviews of new books and other publications. Back issues are listed and can be secured without charge.

Key Elements of a National Energy Strategy
Thinking Through the Energy Problem
International Economic Consequences of High-Priced Energy
Committee on Economic Development, 477 Madison Avenue, New York, NY 10022

These three publications are useful only as a teacher resource, but they do bring into focus important questions for economics of energy instruction. Discussions about the unrestricted market, international supply and trade, the environment, and the importance of a national strategy for the allocation of a scarce resource bring central issues into a clear focus.

One of the major questions associated with economics of energy is the relationship between energy supply and economic growth in America and the rest of the Western world. A classic publication, although dated, and widely disputed is:

*Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, and William W. Behrens III, *The Limits of Growth*. New York: Universe Books, 1972

A project of the Club of Rome, *The Limits of Growth* brought into public debate the close relationship between scarce resources (often fuels) and economic growth. The pessimistic view presented by the Club of Rome has since been challenged by various alternative views of resource allocation and management. An important source of background reading for the teacher.

A publication that is more up to date and considered to be better balanced than *The Limits of Growth* is:

Robert Stobough and Daniel Yergin, *Energy Future: Report of the Energy Project at the Harvard Business School*. New York: Random House, 1979.

Provides a detailed and comprehensive description of current U.S. energy supply and demand in a global context. The text challenges consuming nations to move toward overall energy efficiency in order to strengthen their economies and give them new investment opportunities.

Long before the OPEC embargo and the energy crisis of the 1970s, questions were raised about the production of fossil and nuclear fuels and environmental effects. While many of these questions have been addressed in earlier references, the economics of energy educator would do well to read the following publication:

*Garret DeBell (ed.), *The Environmental Handbook*. New York: Ballantine Books, Inc., 1970

This collection of essays focuses upon the future of the American environment. Most of the essays were produced for the Friends of the Earth group. The questions in the essays could easily be used as stimulus material for the introduction of an economics of energy unit.

Some other publications that take up matters concerning the outlook for renewable sources of energy are:

Amory B. Lovins, *Soft Energy Paths: Toward a Durable Peace*. New York: Harper & Row/Harper Colophon, 1977.

_____, *World Energy Strategies: Facts, Issues, and Options*. New York: Harper & Row/Harper Colophon, 1980.

Denis Hays, *Rays of Hope: The Transition to a Post-Petroleum World*. New York: Norton, 1977.

Hazel Henderson, *The Politics of the Solar Age: Alternatives to Economics*. Garden City, NY: Anchor Press/Doubleday, 1981.

Barry Commoner, *The Poverty of Power: Energy and the Economic Crisis*. New York: Knopf/Bantam, 1976.

Every social studies and science classroom needs source material to chronicle the emergence of the energy crisis of the late 1970s. One of the best collections of historical, political, and economic documents related to the energy crisis can be found in:

Energy Policy, 2nd Ed. Congressional Quarterly Inc., 1414 22nd Street, N.W., Washington, DC 20037

This volume contains an excellent chronicle of the events from 1974 to 1980 that mark the development of the energy crisis. Political issues centered upon governmental regulation of the marketplace and decontrol of energy prices are central discussions. The book concludes with a chronological presentation of energy legislation since 1973.

BACKGROUND RESOURCES FOR STUDENTS

This section contains some exemplary samples of materials that would provide background reading, data, and graphics on the economics of energy. The length of the list could have been extended by including government, history, and economics textbooks that contain some problems, descriptions, or explanations of the economics of energy issues. Because such examples were scarce and transitory, we did not include textbooks.

Natural gas and electric utilities are vitally concerned with the economics and energy issues confronting American society. Consequently, many utilities provide schools with materials on economics of energy. One of the more stimulating programs distributed by public utilities is:

Aunt Energina Program (K–6)
The Electric GNUS (7–9)
Innovative Communications, 2923 North Main Street, Walnut Creek, California 94596

These materials are primarily concerned with the conservation of energy by the consumer. Implications for the demand and supply of energy are present, but the materials do not primarily involve substantive economics. The materials are colorful and motivational. A filmstrip and teacher's guide are included. The materials are made available to schools through the sponsorship of local utilities.

**The Politics of Energy*. Innovative Communications, Inc. 2923 North Main Street, Walnut Creek, California 94596

The primary focus of this complex simulation is the legislative process applied to energy. Much of the debate students encounter has to do with concepts of government in the marketplace. Concepts of scarcity, allocation, the environment and government regulation are thoroughly explored. The packet includes databanks, student readings, and a teacher's guide. The simulation takes about three weeks; however, it can be directly substituted for the traditional unit on the legislative process.

A similar program is:

Energy 80. Enterprise for Education, Inc., Suite 2137, 10960 Wilshire Boulevard, Los Angeles, California 90024

These resource booklets are distributed in various states under state, local, and/or corporate sponsorship. The materials include graphics on energy production, distribution, supply and demand, and conservation practices. Many of the activities are closely correlated to activities prepared by the NSTA for the Department of Energy. *Energy 80* is appropriate for the middle grades and junior high school.

Enterprise for Education is currently developing a new set of materials on "economics and decision-making," using energy as the organizing theme. Publication was scheduled for 1983.

The U.S. Department of Energy has produced:

History of Energy. Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830

Produced as an easy reader on energy history for the general public and for students, the material illustrates how resources are limited, how the doubling principle (exponential growth) causes changes in demand, and how inventive genius has led to changes (substitutions) in the uses of energy. Excellent content, but the reading is not always easy.

Also available for the high school student is:

Energy Issues/Consumer Issues. New York: Teachers College Press, 1981

Part of the *Social Science Skills: Activities for the Secondary Classroom* series, this publication includes a teacher's manual and duplicating masters for student activities. The emphasis of the content is on energy, but economic concepts—economic growth, energy production, and consumer behavior—are highlighted. Excellent stimulus material.

A more advanced publication for high school students is:

JoAnne Buggey and June Tyler, *The Energy Crisis: What Are Our Choices.* Englewood Cliffs, N.J.: Prentice-Hall, 1981

This is one title in a series, *Inquiry into Crucial American Problems.* The content is a series of open-ended questions about energy production and consumption in America. While the focus of the material is not on economics, the teacher could use the questions and essay materials to stimulate the analysis of economics of energy issues. Advanced reading.

One of the most readable and stimulating background sources on energy for high school students is:

**Energy.* National Geographic Society, 17th and M Streets, Northwest, Washington, DC 22036

This is a straightforward discussion of the world's energy resources both known and potential. The pictures are excellent. While not focused on economics, the discussion of fuel production and alternative fuels does describe capital costs, externalities, and substitutability in fuels.

The social studies and science classrooms always benefit from materials that contain substantive information and different perspectives. Texaco Incorporated distributes a valuable source:

**Texaco's Report to America's Youth: The Quest for Energy.* Manager of Publications, Texaco Incorporated, 2000 Westchester Avenue, White Plains, NY 10650

Excellent supplementary material for the economics of energy classroom. Structured as a financial report of an oil company, the contents emphasize the capital intensity in exploration for and production of oil; transportation costs; market structures; environmental issues; and corporate financial statements.

Energy graphics are a basic need for every classroom teacher. Until recently easily reproducible graphics were difficult to secure. Now you can copy good graphics from:

**Social Education* (vol. 46): March 1982, "Energy Search"; April 1982, "Solar Promise"; May 1982, "Nuclear Promise."

Social Education is the official publication of the National Council for the Social Studies (NCSS). These graphics were prepared for NCSS under the direction of John Fowler, director of special projects for the National Science Teachers Association (NSTA). The graphics present the economics of energy

exploration, production, distribution, and price, and the effects of changing demand on price. The materials are presented in poster form for copying or wall mounting.

Another source of illustrated materials is:

•*Energy Graphics*. World Eagle, Department T, 64 Washburn Avenue, Wellesley, Massachusetts 02181. (To be published by Prentice-Hall in 1983.)

Energy Graphics contains 88 pages of reproducible graphs, charts, tables, and maps on energy. The economics of energy is presented through graphics illustrating market prices, changing prices, and the influence of substitutable fuels on market demand. A monthly publication, *World Eagle*, presents current events topics in graphic form. *Worldview Posters*, on current topics, includes several that highlight the economics of energy.

TEACHING UNITS AND ACTIVITIES

The reference materials in this section may be used by teachers who do not have much background in economics or energy information. The materials typically present background reading for the teacher, instructional objectives, and teaching activities.

In our search for the most frequently used materials in economics of energy, the most often cited reference was:

•*The Mochans*.

The materials, designed for grades 7–12, feature the market-oriented economic system. *The Mochans* was developed to accompany *The Kingdom of Mocha*, a film based on a mythical island economy. (The film is available from Modern Talking Picture Service on free loan or to videotape with the permission of Amoco). The printed materials may also be used as a self-contained unit. *The Mochans* does not contain specific references to the economics of energy, but it is one of the best overviews of the market system; concepts of exchange, production, scarcity and economic stability are featured. Materials include background information for the teacher, pre- and post-tests, student activity duplicating masters, and a selection of significant economics questions.

Economics of energy materials available from Amoco Educational Service include:

The Mochans (Grades 7–12)
The Energy Crisis (Grades 4–6)
Living With Energy (Grades 7–10)
•*Energy Adventure* (Grades 9–12)
Amoco Educational Services, Public Affairs, MC-3705, P.O. Box 5910-A, Chicago, Illinois 60680.

Energy Adventure contains teacher and student resource materials on the sources of energy; the history of energy; and the production, distribution, and conservation of energy. Background information for the teacher, numerous graphics (maps, charts, graphs and illustrations), and eight duplicating masters for student use make this an easily taught unit. Another student activity, *Energy and Economics* (available free), introduces economic concepts involved in energy production and consumption.

Materials in a similar format include:

Ecology and Energy Action Pack. Director, Corporate Responsibility, McDonald's Corporation, One McDonald Plaza, Oak Brook, Illinois 60521

The *Action Pack* consists of background materials for teachers and a series of duplicating masters for the students. Six short units are included, be-

ginning with ecological concerns and concluding with energy issues. Economic concepts are minimal with the exception of an underlying value that citizens are responsible for conserving and reclaiming energy (grades 4–6).

Energy/Ecology/Economics. Consumer Information Services, Sears, Roebuck and Company, D-703 Sears Tower, Chicago, Illinois 60684.

This short pamphlet provides background questions for the study of economics of energy, suggested goals for student learnings, a compilation of important concepts and generalizations in the economics of energy, discussion questions, and teaching activities. Recommended for grades 1–8.

A unique teaching resource is:

**The Politics of Energy.* Innovative Communications, Inc., 2923 North Main Street, Walnut Creek, California 94596

The primary focus of this complex simulation is the legislative process applied to energy. Much of the debate students encounter has to do with concepts of government in the marketplace. Concepts of scarcity, allocation, the environment, and government regulation are thoroughly explored. The packet included databanks, student readings, and a teacher's guide. The simulation takes about three weeks; however, it can be directly substituted for the traditional unit on the legislative process.

The Department of Energy (DOE) contracted with the National Science Teachers Association (NSTA) to produce teacher and student materials on energy education. Under the title "Project of an Energy-Enriched Curriculum (PEEC)," the NSTA developed a number of units for science, mathematics, and social studies classrooms to promote greater knowledge and awareness of energy issues. All of the materials are organized in a similar fashion. The first part includes a teacher's guide with background information on each of the activities, together with student objectives. The concluding portion of each unit provides student activities, reproducible graphics, and descriptive data. Single copies of the DOE materials may be obtained through the Energy Office in your state or from:

U.S. Department of Energy, Technical Information Office, P.O. Box 62, Oak Ridge, Tennessee 37830

**The Energy Dome.* Grades 4–6 (PEEC).

This unit emphasizes concepts of energy supply, production, farm energy, and energy budgeting for the country and individuals. Fine graphics.

**The Energy Challenge.* Grades 5–8 (PEEC).

This unit contains background reading material for the teacher, a list of student objectives, and 24 duplicator activity masters. Much of the material is descriptive but a few of the concluding activities review demand, supply, shortage, surplus, production, and international trade.

**The Energy Future Today.* Grades 7–9 (PEEC).

This unit introduces the concepts of scarcity, market allocation, energy trade-offs, conservation, short-run and long-run effects. Good graphic materials stimulate economic questions about coal and nuclear fuels.

**Energy, Engines and the Industrial Revolution.* Grades 8–9 (PEEC).

This unit focuses upon the changing sources of energy in the United States. Although economic concepts are not emphasized, a resourceful teacher can use the materials to help students to understand the market system, scarcity and price, industrial development, and energy demand.

**Energy in the Global Marketplace.* Grades 9–11 (PEEC).

The unit includes concepts about taxation, market forces, comparative economic systems, absolute advantage, balance of trade, inflation, and international investment. The unit concludes with a simulation on "The Oil Price Game."

Agriculture, Energy and Society. Grades 10–12 (PEEC).

The unit reviews how energy is converted into food. A simulation illustrates the concept of diminishing returns in the food-production cycle. Students should come to understand how energy prices influence markets.

U.S. Energy Policy—Which Direction? Grades 11–12 (PEEC).

Designed as a unit on energy issues for the senior government course, the activities illustrate underlying economic concepts such as energy supply, resource allocation, economically recoverable energy resources, international investment, and trade deficits.

The DOE also provided grants to state energy agencies to disseminate energy education materials and to produce additional economics of energy materials. Among those, perhaps the most useful and frequently cited is:

Kenneth Leonard, Robert Reinke, Donald Wentworth, and George Whitnery, *Energy Tradeoffs in the Marketplace*. Published through the efforts of the Washington Council on Economic Education and the Washington State Department of Public Instruction, 7510 Armstrong Street, Southwest, Tumwater, Washington 98504.

This excellent teaching unit contains 15 lessons about the economics of energy. Each lesson is targeted to selected concepts, including opportunity costs, scarcity, market forces, interdependence, social benefits and costs. The graphics are excellent and readily reproducible. A must for the teacher planning a unit on the economics of energy.

Also available through the Washington State Department of Public Instruction is *Energy, Food and You*, containing extensive collections of activities, data sources and graphics on energy. The activities are not organized into units or lessons; however, many of the ideas are extremely valuable to the creative teacher.

The Iowa Energy Policy Council supported development of:

Iowa Developed Energy Activity Sampler. State Department of Public Instruction, Des Moines, Iowa

This extensive publication contains a section outlining important learning goals for energy education, many of which emphasize economic concepts. The latter portion of the volume contains teacher-constructed lessons on the economics of energy. An excellent teacher resource.

Other state energy agency products include:

Anne Ryan (ed.), *Teaching Economics Through Ecology*. Developed by the Economic Education Council of Massachusetts and the Massachusetts State Teachers Association, 19 Fort Hill Street, Bingham, Massachusetts 02043

This single volume contains 31 lesson plans on economics and ecology (frequently energy related.) Each lesson lists learning outcomes, describes the content, suggests teaching activities, and recommends supplementary resources. An excellent resource for the department library. The material is available in print or on fiche.

Minnesota Energy Activities, Energy Education in Elementary Social Studies and *Natural Gas Prices*. Minnesota State Department of Education, Capitol Square, 550 Cedar Street, St. Paul, Minnesota 55101

Energy Activities consists of loose-leaf activity cards in which economic concepts are somewhat peripheral. The materials are designed to promote thinking skills about energy issues. *Energy Education in Elementary Social*

Studies is designed in much the same way, only the activities cards are correlated with selected social studies textbooks.

•*Natural Gas Prices* is a unit containing student activities for problem-solving the economics of natural gas prices. The folder contains readings on governmental regulation of natural gas prices and the unregulated market alternatives. Students analyze both perspectives while considering their impact upon production, supply, distribution, and demand.

•*Energy Education Curriculum Project.* Indiana Department of Public Instruction, 220 State House, Indianapolis, Indiana 45204

This extensive energy education project includes numerous volumes with suggested unit outlines (K-12), student activities, and graphics. Many of the units are based upon economic concepts of energy. Good resource.

Economic Concepts for Nebraska's Junior High School Students
Basic Teaching Units on Energy.
Nebraska Department of Education, 301 Centennial Mall South, Lincoln, Nebraska

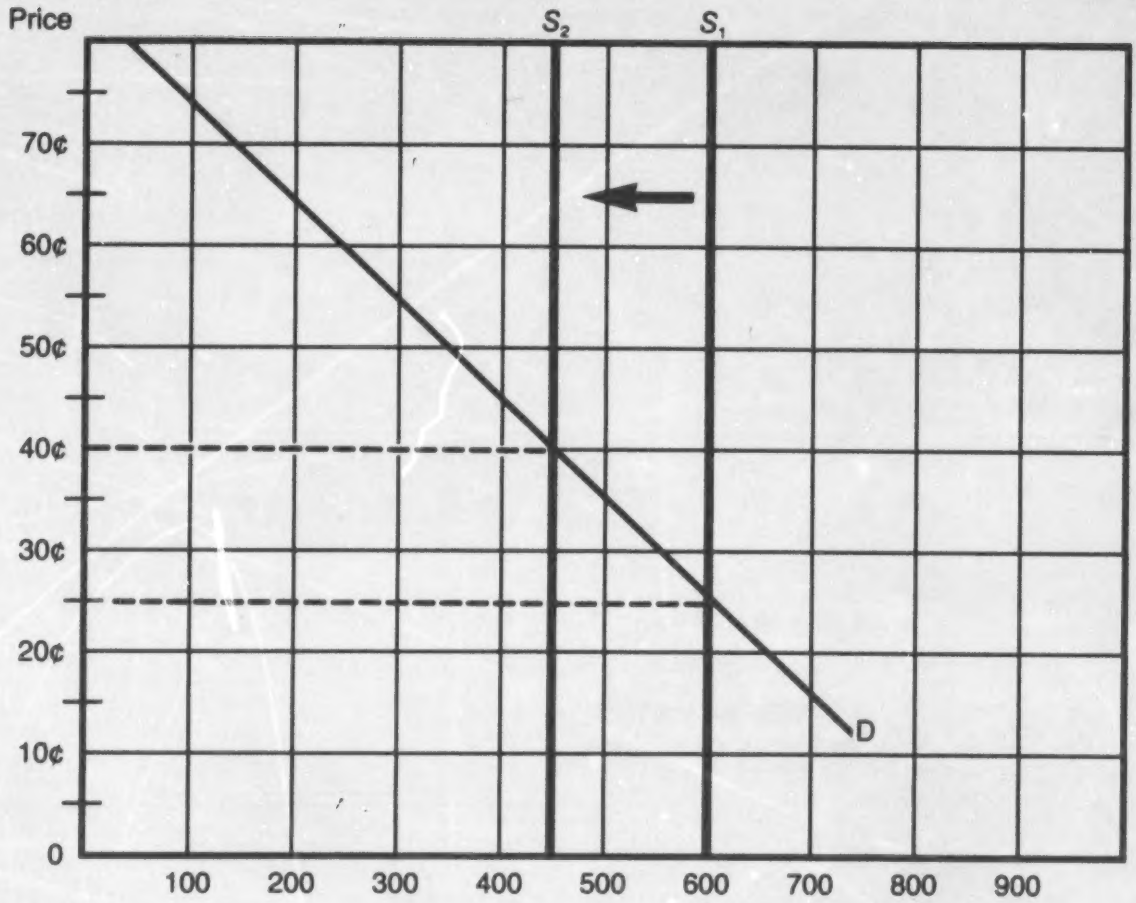
Economic Concepts provides a basic conceptual framework for the teaching of economics in the middle grades. Suggested units of study (for various subjects) are keyed to the conceptual structure.

•*Basic Teaching Units* is a compilation of teaching units prepared by classroom teachers. The units are designed for the various grade levels. An excellent resource for science and social studies departments.

Visual 1-1

MARKET CLEARING PRICE

Class Demand/Supply Curve



At all prices below 25¢ the quantity demanded exceeds the quantity supplied. This is a shortage. If supply decreases, then the price must increase if a shortage is to be avoided. For the change in supply, a price increase to 40¢ will clear the market.

From *The Economics of Energy: A Teaching Kit (Grades 7–12)*, 1983. Joint Council on Economic Education, 1212 Avenue of the Americas, New York, N.Y. 10036.

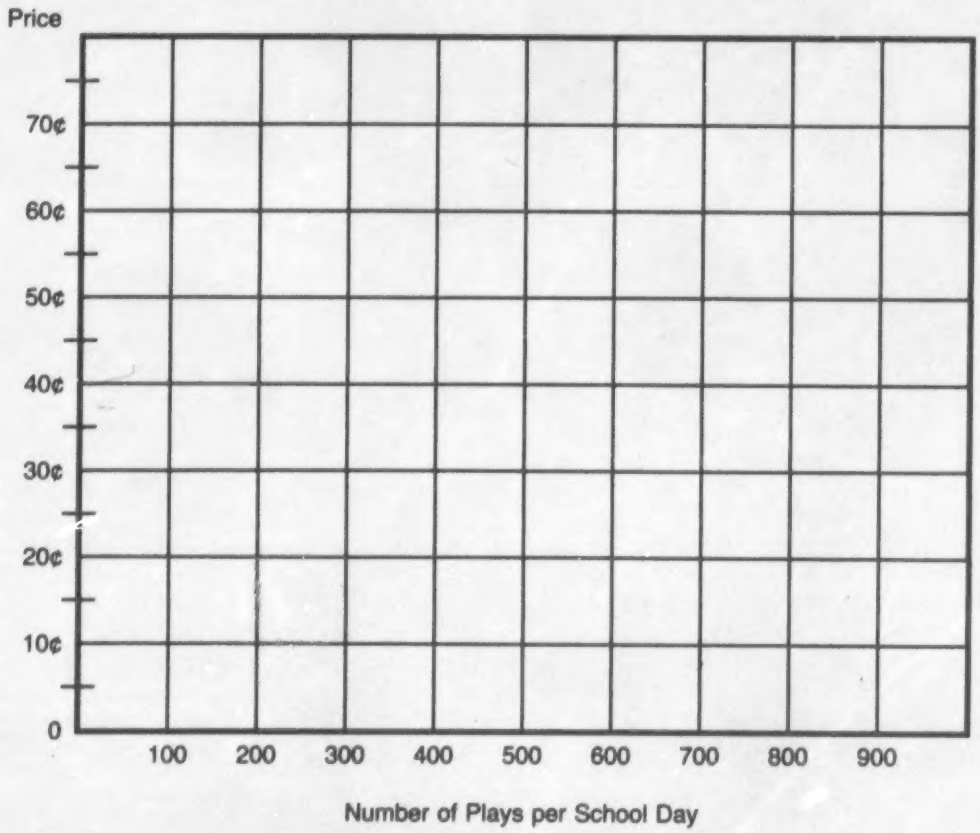
Handout 1-1

DEMAND FOR PAC-MAN PLAYS

Demand Schedule

Price	Quantity Demanded per School Day
50¢	_____
45¢	_____
40¢	_____
35¢	_____
30¢	_____
25¢	_____
20¢	_____
15¢	_____
10¢	_____
5¢	_____

Class Demand/Supply Curve



From *The Economics of Energy: A Teaching Kit (Grades 7–12)*, 1983. Joint Council on Economic Education, 1212 Avenue of the Americas, New York, N.Y. 10036.

Handout 1-2

SUPPLY OF PAC-MAN PLAYS

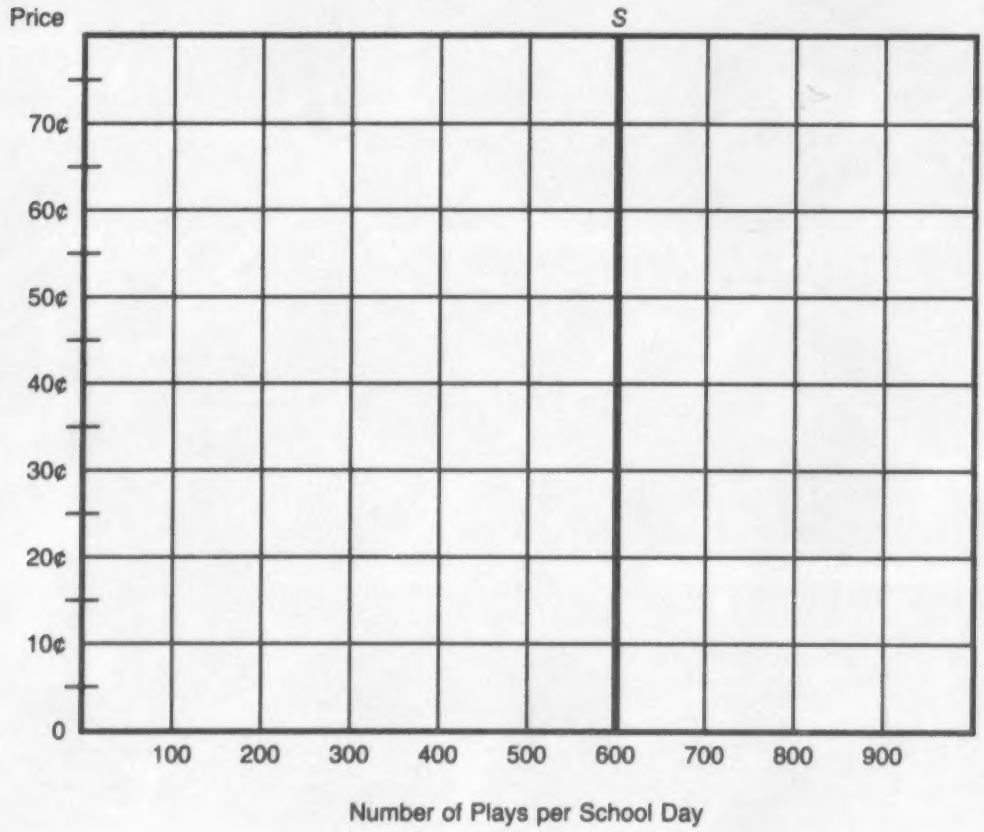
Maximum Number of Plays per Day =

$$\frac{\text{Hours in Minutes per Machine}}{\text{Average Time per Play}} \times \text{Number of Machines}$$

Example: A person with average skills might take 5 minutes to play one game. Five machines are available for 10 hours on a week day for student play. The maximum number of plays available is 600:

$$\frac{10 \text{ hours} \times 60 \text{ minutes}}{5 \text{ minutes per play}} \times 5 \text{ machines} = \frac{600}{5} \times 5 = \frac{3000}{5} = 600$$

Hypothetical Supply Curve



From *The Economics of Energy: A Teaching Kit (Grades 7–12)*, 1983. Joint Council on Economic Education, 1212 Avenue of the Americas, New York, N.Y. 10036.

Handout 2-1

OIL PRICE DROP NOT BLESSING?

New York (AP)
Thursday, March 18, 1982

While consumers may be gloating over the steep drop in oil prices, OPEC ministers are gathering for an emergency session Friday to try to stop the slide.

Faced with a global oil glut that is pushing down prices, the Organization of Petroleum Exporting Countries is meeting in Vienna, Austria, to try to prevent a collapse in prices.

Some Western economists say the world should be rooting for OPEC. Too quick a decline in prices, they say, may create nearly as many headaches for the West as did the price shocks of the 1970's.

The benefits of the decline are obvious.

The slide has slowed inflation, and economists believe that will help pull interest rates lower and revive the economy. The trend also is shifting the balance of oil power from OPEC to the West.

But some economists say danger signals are being missed amid the euphoria created by cheaper energy. They are concerned that the drive to conserve, which helped create the oil glut, may be stopped in its tracks if oil prices fall as rapidly as some people are predicting.

"You don't have to do much looking around to see the animal already sniffing at the bait," economist James Bock of Standard Oil Co. (Indiana) said. U.S. auto companies, after spending millions to retool factories to make small, fuel-efficient cars, are seeing renewed strength in sales of big cars. Some corporations are thinking twice about switching from oil to natural gas or other fuels.

Other worries include:

Recent declines in oil prices are straining the economics of Middle Eastern and North African nations that rely almost exclusively on oil-export revenues for internal development. Further losses, analysts say, would heighten the chance of revolution or disruption.

The drying up of oil-revenue surpluses could strain the capital markets as cash-hungry OPEC members try to keep their development ventures going. The group's surplus of funds, which peaked at $116 billion in 1980 is expected to shrink to about $50 billion this year. Within a few years it could dwindle almost to nothing.

Lower oil prices have dampened the oil industry's enthusiasm for exploration. That could work against the oil-importing nations by preventing a further erosion of OPEC's share of the world market.

Some economists, however, dismiss the negative side effects.

"On balance I think it's positive because it means a less inflationary environment," Lawrence Brainard, senior international economist at Bankers Trust Co., said.

The average price of oil sold by contract has fallen only about $1 a barrel, to about $33, since last summer. But the price paid on the spot market, where oil is sold to the highest bidder, has fallen as low as $28 a barrel for some of the world's best grades of crude. Only about 5 percent of the world's oil is traded on the spot market, but that price generally foreshadows changes in contract prices.

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Handout 4-1

RETURN TO RATIONING?

Editorial; *The Wall Street Journal*
March 16, 1982

The benefits of oil decontrol should be patently obvious to anyone who has stopped at a gasoline station recently. Supplies are plentiful, prices are on the decline and competition has returned, with some stations even offering again to wash your windshield and check the oil. This free-market bounty, however, seems less obvious to many members of Congress.

Two weeks ago Congress cleared legislation giving President Reagan authority to resume emergency powers over the allocation of petroleum supplies. It's a power Mr. Reagan has said he does not want; he's quite happy to let the market set prices for oil and arrive at its own distribution pattern in case of a shortage. The Administration says that it already has sufficient authority to allocate oil from the Strategic Petroleum Reserve in case of a severe national emergency.

In approving the new Standby Petroleum Allocation Act, Congress has lost sight of the lessons most everyone else had learned from a miserable decade of oil controls. While oil price controls tended to discourage indigenous production and to prop up OPEC's supposed pricing power, allocation controls were primarily responsible for the gasoline lines, which occurred so often in the 1970's. Bureaucratic rigidity of the allocation system meant that it could not meet the changing demands of a dynamic market. Federal regulators forced oil companies to send gasoline to parts of the country that already had an overabundance of supplies while other areas went dry. Thus, motorists in many areas had to wait hours for gasoline, while others faced no inconvenience at all. Much of the public and the news media, of course, blamed OPEC and the oil companies for the gas lines when the real culprits were in Congress.

The impetus for the new standby allocation controls comes in part from a deep-seated distrust in the capability of the free market. For instance, Sen. J. Bennett Johnston, one of 87 Senate supporters of the bill, said the free market could not handle large-scale disruptions of oil imports. Others simply assume that in case of another emergency, Congress will necessarily have to act to regulate the market. Rep. Philip R. Sharp, who managed the bill in the House as Chairman of an energy and commerce subcommittee, said it would be wiser to legislate now when "passions are low" than in a crisis.

In spite of Mr. Sharp's statement, passions are not so low now. The biggest supporters of the legislation outside Congress are precisely those petroleum purchasers who received special privileges under the old, lopsided system—farmers, some refiners, the governors and public service agencies, such as fire and police.

President Reagan's advisers are recommending that he veto the legislation, but there is a chance that Congress could manage to override it, given the Senate vote and the House's vote of 246-144 on March 3. After the energy foolishness of the 1970's, Congress can hardly afford the new folly an override would represent.

Oil controls don't work, "large-scale disruption" or not. No bureaucracy can match the allocative efficiency of the market. The lag between changes in the oil marketplace and bureaucrat decisions only succeeds in creating windfalls for some and shortfalls for others.

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Handout 4-2

BILL TO GIVE PRESIDENT POWERS IN OIL CRISIS VETOED

News item; *The Wall Street Journal*
March 22, 1982

Washington—President Reagan vetoed a bill giving the President the authority to set petroleum prices and allocate supplies during any future oil shortages.

Mr. Reagan said the bill was bassd on the faulty premise that the added powers would ensure a fair and orderly distribution of oil in time of crisis.

Top Reagan administration officials also have argued that under existing law, the President already has the authority to take some steps to apportion oil during a shortage. The officials contended it was unnecessary to give the President added authority before a specific crisis arose.

But backers have claimed it is important for the government to draw up allocation plans before an emergency. And they have noted that the bill would allow the President to decide whether to put the plans into effect.

The veto was President Reagan's third. Congress didn't override the previous two but the situation might be different this time.

The bill has strong, bipartisan support in Congress. In October, the Republican-controlled Senate passed the bill 86 to 7, despite Mr. Reagan's opposition. The House passed a somewhat weaker measure in December by a vote of 246 to 144.

James McClure (R., Idaho), chairman of the Senate Energy Committee and a strong supporter of the bill, said he was disappointed with the President's action. But he said he would consult with other congressional leaders before deciding whether to try to override the veto, which would require a two-thirds vote by both houses.

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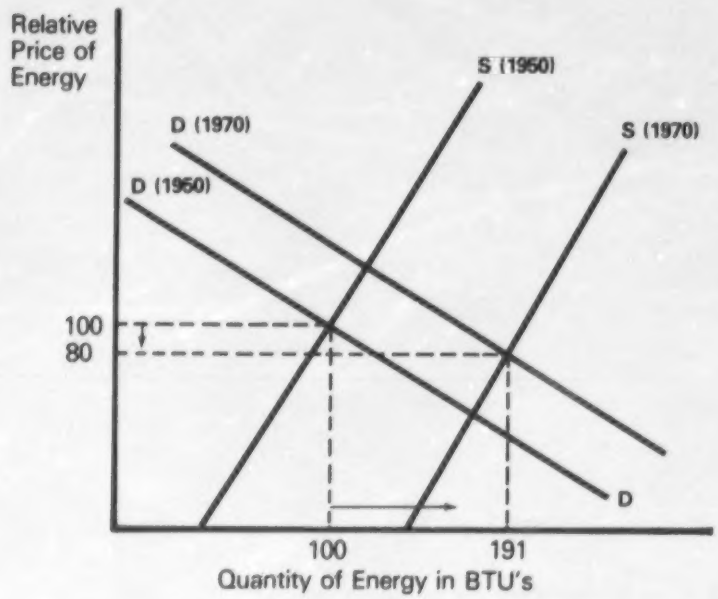
Handout 6-1

THE MARKET FOR ENERGY

The market for energy changed substantially between 1950 and 1970. By setting the price and quantity consumed in 1950 equal to 100, the change can be graphed.

Energy Market—1950-1970



As the graph indicates, the annual consumption of energy increased by 91 percent. At the same time, the combined effect of the large increase in supply relative to the increased demand resulted in a 20-percent decline in the price of energy relative to other goods. A few questions emerge; they are:

1. Why did the consumption of energy almost double in the twenty years from 1950 to 1970?

2. Why did the supply shift substantially?

3. How is it possible for the price of energy to fall by 20 percent during the twenty-year period although demand went up?

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Handout 8-1

READING GRAPHS

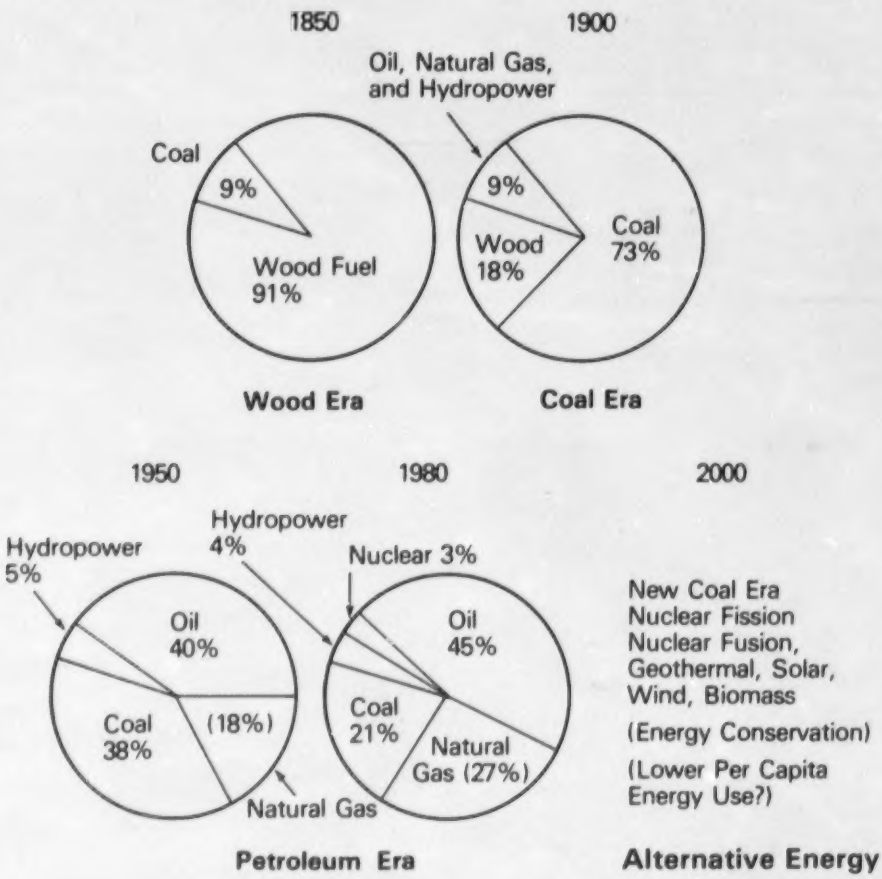
A. INTRODUCTION

The field of energy information is enormous. A student of the subject can become overloaded with facts and never arrive at the answers being sought. To overcome that problem students must develop two skills: asking the right questions and understanding how to read tables and charts.

Asking the right questions means that an investigator has thought about the subject and decided what information is needed. By putting these decisions into question form, a student can quickly look over information and only concentrate on facts that relate to the questions.

Reading graphs is useful to an investigator because they are efficient ways to present information concerning matters having to do with quantities. Look at the graphs in Figure 8-1. Imagine how many sentences it would take to communicate the same information in words.

Figure 8-1 **Changing Patterns in the Use of Energy Resources in the United States**



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Handout 8-1 (continued)

B. TECHNIQUES

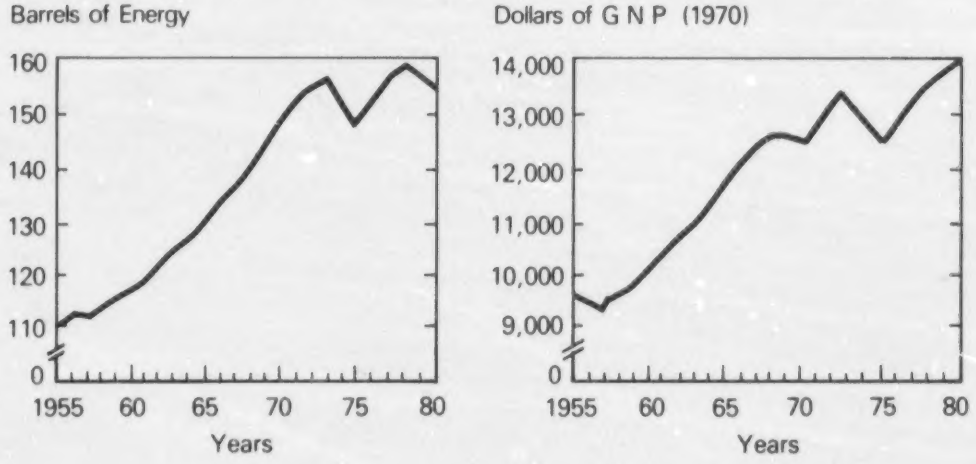
Graphs usually appear to be quite complex, abstract, and overwhelming. At first, any complex graph, map, or research problem may seem overwhelming and cause you to ask, "Where do I begin? How am I ever going to do this?" The trick is not to look at the whole task. Concentrate on one thing at a time and for the moment ignore all other parts of the graph, map, or problem.
Take on the task one step at a time and you will develop skill in handling quantitative information.

1. Begin with the title. Read this carefully so you know what subject the graph is about. Often people try to make the graph prove something it doesn't even deal with.
2. Determine the meaning of the labels (categories) on the horizontal and vertical axis. These will tell you what is being compared and how the comparisons are made.
3. Extract the facts from the graph.
4. Then draw inferences from the graph and evaluate the data.

Now practice these steps on the following two graphs in Figure 8-2.

Figure 8-2

Energy Use and GNP per Employed Person in the U.S.



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Handout 8-1 (concluded)

C. GETTING THE FACTS FROM THE GRAPHS IN FIGURE 8-2

1. A good title will tell you what information you should find on a graph. What information do you expect to find in the graphs?

2. What are the titles on the vertical axis of the graphs?

3. What is the title on the horizontal axis of the graphs?

4. What is included in the category Barrels of Energy?

5. What is included in the category Dollars of GNP (1970)?

6. The lines plotted in the two graphs indicate how much energy was used and how much GNP was produced by each employed person in the United States. How much energy was used in 1955, in 1957, in 1972, and in 1975? Compare your answers with those of another student.

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Handout 8-2

DRAWING INFERENCES FROM THE GRAPHS IN FIGURE 8-2

1. According to these graphs do GNP and energy use move in the same direction or do they move in opposite directions?

2. Are there any situations where the normal pattern of change is not followed?

3. How important does energy use seem to be for producing GNP?

4. Make an educated guess. Can the U.S. economy continue to produce high levels of GNP if we reduce our use of energy?

5. Make another guess. Do you think we have a high level of production (GNP) because we use a large amount of energy or do we use a large amount of energy because we have a high rate of production? Why might it be helpful to find the answer to this question?

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Visual 10-1

SAMPLE OF INDIVIDUAL TRANSACTION SHEETS

SELLER'S TRANSACTION SHEET

No. of Barrels (I)	Transaction Price (II)	Cost of Production (III)	Gains (IV)	Losses (V)
1	$15.00	$10	$5	
1	$30.00	$10	$20	
1	$25.00	$10	$15	
1	$20.00	$15	$5	

BUYER'S TRANSACTION SHEET

Units of Energy (I)	Oil Transaction Price (II)	ALTER Price (III)	Dollars Spent (IV)
1	$20	$35	$20
1	$15	$35	$15
1	$22	$35	$22
1		$35	$35

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Visual 10-2

CLASS TRANSACTION SHEET

Sale Price	Round 1	Round 2	Round 3
$35			
$34			
$33			
$32			
$31			
$30			
$29			
$28			
$27			
$26			
$25			
$24			
$23			
$22			
$21			
$20			
$19			
$18			
$17			
$16			
$15			
$14			
$13			

Handout 10-1

INSTRUCTIONS FOR PLAYING THE OPEST GAME

1. At the beginning of each round, go to the marketplace.

   If you are a seller:

   Find a buyer who wants to make a transaction. Agree on selling one barrel of oil and on a *transaction price.* Record the agreed-on transaction price in column II of your "Individual Transaction Sheet." Also have the recorder mark the deal on the Class Transaction Sheet. Then return to the marketplace.

   If you are a buyer:

   Find a seller who wants to make a transaction. Agree on buying one barrel of oil and on a *transaction price.* Record the agreed-on transaction price in column II of your Individual Transaction Sheet. Then return to the marketplace.

2. Make as many deals as you wish during each round. When deciding on transaction prices, increases or decreases in the sale price may occur only in $1.00 amounts. At the end of each round of dealing, buyers will figure total cost of energy consumption by adding the transaction prices of oil and ALTER purchased, and sellers will figure gains or losses by subtracting the cost of production from the transaction prices. Record the results of the calculations on your transaction sheet.

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Handout 10-2

INDIVIDUAL TRANSACTION SHEET—SELLER

Check one: Independent _____ OPEST _____

ROUND 1 Want to sell _____ barrels

No. of Barrels (I)	Transaction Price (II)	Cost of Production (III)	Gains (IV)	Losses (V)
1		$10		
1		$10		
1		$10		
1		$15		
1		$15		
1		$15		
1		$25		
1		$25		
1		$25		
1		$35		

Total number of barrels sold ____ Total gain ____ Total loss ____ Net Gain/Loss (Circle one)

ROUND 2 Want to sell _____ barrels

No. of Barrels (I)	Transaction Price (II)	Cost of Production (III)	Gains (IV)	Losses (V)
1		$10		
1		$10		
1		$10		
1		$15		
1		$15		
1		$15		
1		$25		
1		$25		
1		$25		
1		$35		

Total number of barrels sold ____ Total gain ____ Total loss ____ Net Gain/Loss (Circle one)

ROUND 3 Want to sell _____ barrels

No. of Barrels (I)	Transaction Price (II)	Cost of Production (III)	Gains (IV)	Losses (V)
1		$10		
1		$10		
1		$10		
1		$15		
1		$15		
1		$15		
1		$25		
1		$25		
1		$25		
1		$35		

Total number of barrels sold ____ Total gain ____ Total loss ____ Net Gain/Loss (Circle one)

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Handout 10-3

INDIVIDUAL TRANSACTION SHEET—BUYER

Round 1 Want to buy 5 units of energy

Units of Energy (I)	Oil Transaction Price (II)	ALTER Price (III)	Dollars Spent (IV)
1		$35	
1		$35	
1		$35	
1		$35	
1		$35	

Total number of barrels sold _____ Total gain _____ Total loss _____ Net Gain/Loss (Circle one)

Round 2 Want to buy 5 units of energy

Units of Energy (I)	Oil Transaction Price (II)	ALTER Price (III)	Dollars Spent (IV)
1		$35	
1		$35	
1		$35	
1		$35	
1		$35	

Total number of barrels sold _____ Total gain _____ Total loss _____ Net Gain/Loss (Circle one)

Round 3 Want to buy 5 units of energy

Units of Energy (I)	Oil Transaction Price (II)	ALTER Price (III)	Dollars Spent (IV)
1		$35	
1		$35	
1		$35	
1		$35	
1		$35	

Total number of barrels sold _____ Total gain _____ Total loss _____ Net Gain/Loss (Circle one)

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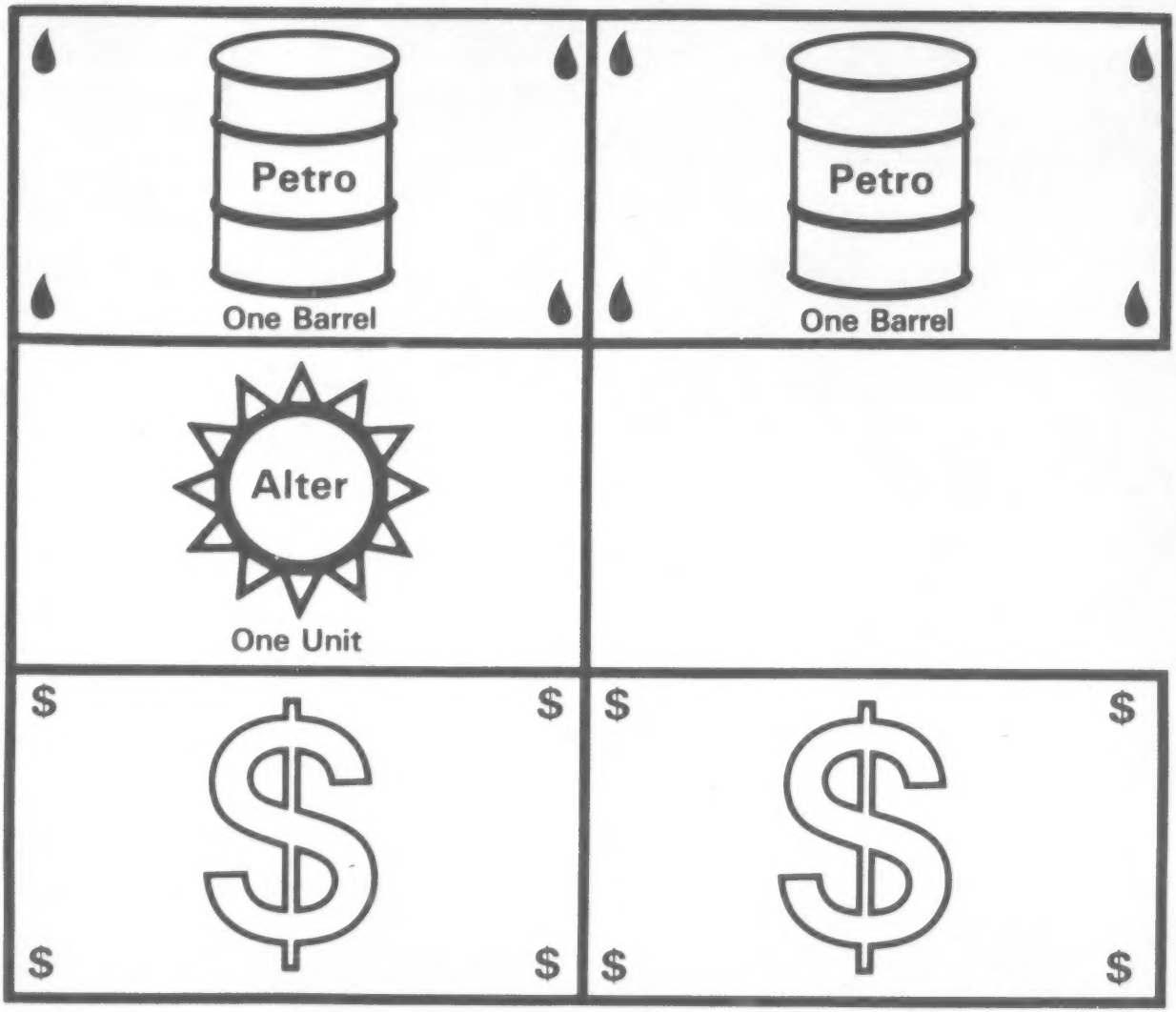
Handout 10-4



Handout 11-1

PROPOSALS FOR REDUCING ENERGY USE

Directions: Rate the proposals according to the following scale:

A = I strongly agree with the proposal.

B = I agree with the proposal.

C = I can't make up my mind.

D = I disagree with the proposal.

E = I strongly disagree with the proposal.

Rating

_____ 1. Increase the age at which a person can get a driver's license to 21.

_____ 2. Lower air pollution standards so industries can burn high-sulfur coal rather than oil or natural gas which cause less pollution.

_____ 3. Ban all students from driving to school if bus transportation is available.

_____ 4. Ban all driving of private cars on Sunday.

_____ 5. Ration gasoline so every driver can obtain only a fixed amount.

_____ 6. Ban the use of recreational vehicles such as campers, minibikes, snowmobiles, and pleasure motorboats.

_____ 7. Reduce city streetlights by at least 25 percent.

_____ 8. Ban auto racing to save fuel.

_____ 9. Ban the use of nonessential household appliances such as garage-door openers, electric can openers, color TVs, electric toothbrushes, garbage disposal units, blenders, and stereo systems.

_____ 10. Require all schools to have a three-month winter break to save fuel, rather than a three-month summer break.

_____ 11. Reduce oil and natural gas supplies to all industries by 20 percent.

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